AUGUST 22, 1931

# Railway Age

*Founded In 1856*

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## Stronger Track Will Cost Less

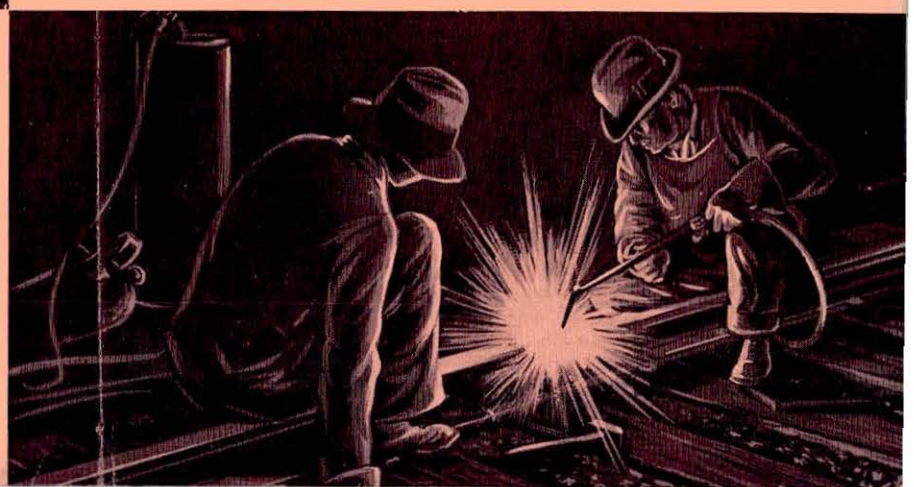
Heavier rail sections, better fastenings, better material in frogs and crossings, heat treating, curve oilers, building up battered ends by welding—these are some of the means whereby the railways can lower operating costs.

Article No. 7
Operating Economy Series
See Page 276

### Next Week
Article No. 8

"Railroads Wise Will Motorize"

Featuring industrial tractors, crane trucks, lift trucks, and other trackless power material handling equipment.



For nineteen years, The Oxweld Railroad Service Company has contributed to the efficiency of American railroads by providing them with the best methods and materials for oxy-acetylene welding and cutting. Year after year, the majority of Class I railroads are finding Oxweld Railroad Service of increasing value.

THE OXWELD RAILROAD SERVICE COMPANY
*Unit of Union Carbide and Carbon Corporation*

UCC

NEW YORK, Carbide and Carbon Building
CHICAGO, Carbide and Carbon Building

OXWELD RAILROAD SERVICE

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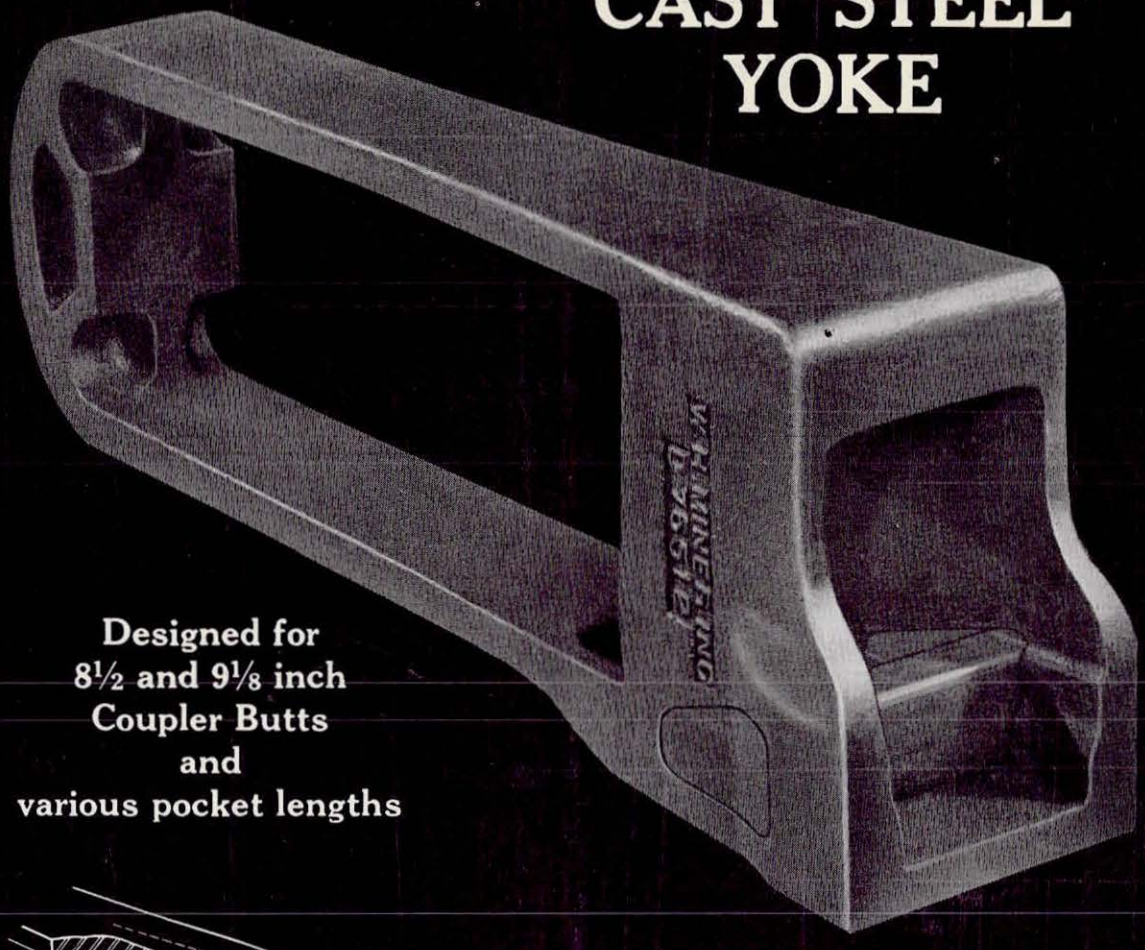
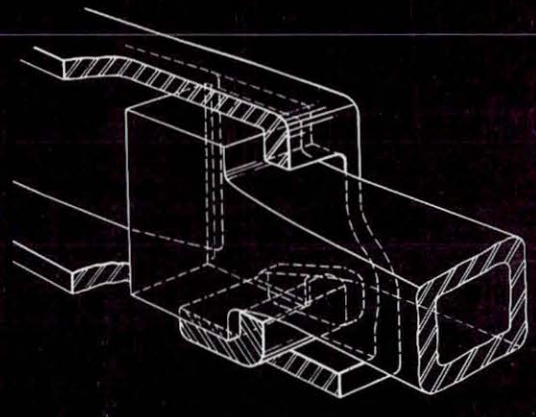
Address communications to 30 Church St., New York City.

# MINER

## CAST STEEL YOKE




Designed for
8½ and 9⅛ inch
Coupler Butts
and
various pocket lengths

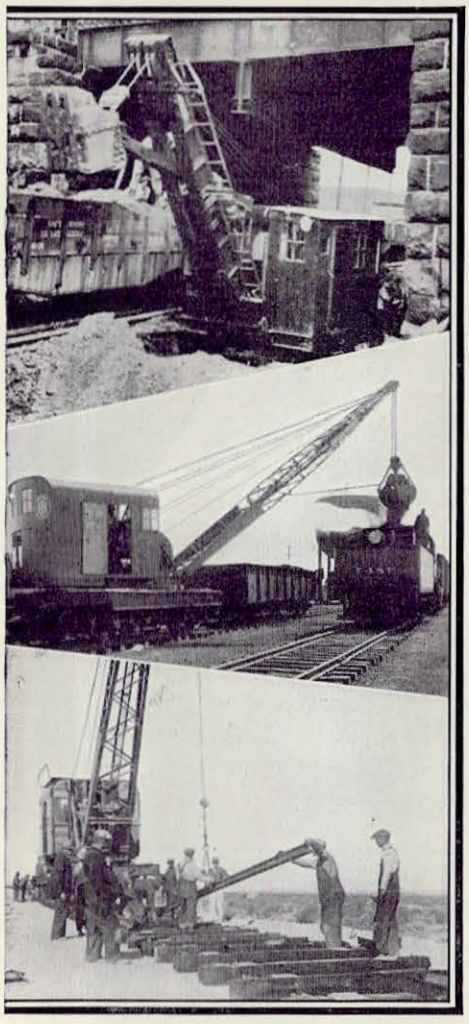


*No alteration of coupler necessary*

This dependable connection does away with the obsolete and troublesome riveted yoke, thus terminating a costly maintenance item which is peculiar to many thousands of existing cars.

## W. H. MINER, INC. CHICAGO

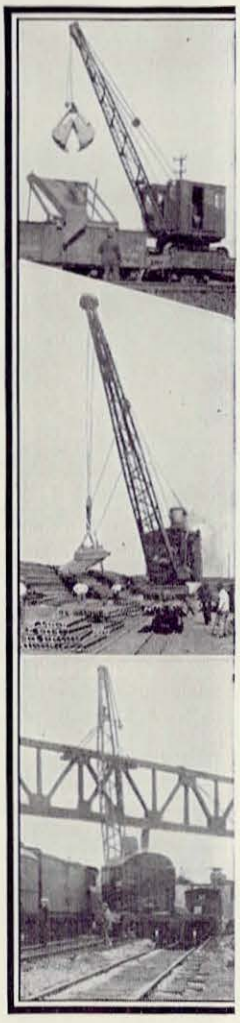
# More Than 2,300 Bought By The Nation's Railroads



Wherever you find the subject of moving materials being studied, wherever handling expense is understood in its true relation to production costs—there you will usually find Industrial Brownhoist cranes at work.

The railroads of America, for example, whose entire profits depend on the economical handling of materials, have bought more than 2,300 Industrial Brownhoists. No other maker of locomotive cranes can show such a record; few can show a total output as large.

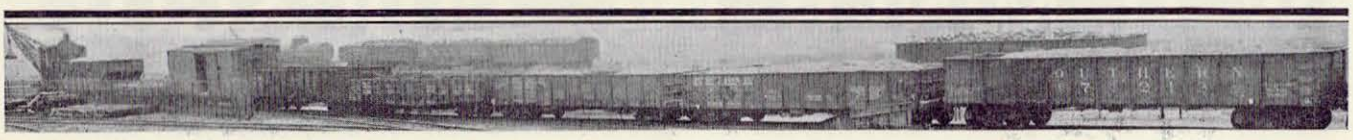
If your business is faced with keener competition, and whose isn't, Industrial Brownhoist can help you lower costs. Finding the way to better and faster handling methods is the full-time job of our factory-trained representatives. Our half century's experience is at your service. Just get in touch with our nearest office.



Industrial Brownhoist Corporation, General Offices, Cleveland, Ohio

District Offices: New York, Philadelphia, Pittsburgh, Detroit, Chicago, New Orleans, San Francisco, Cleveland.

# INDUSTRIAL BROWNHOIST



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# Railway Age

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Vol. 91 August 22, 1931 No. 8

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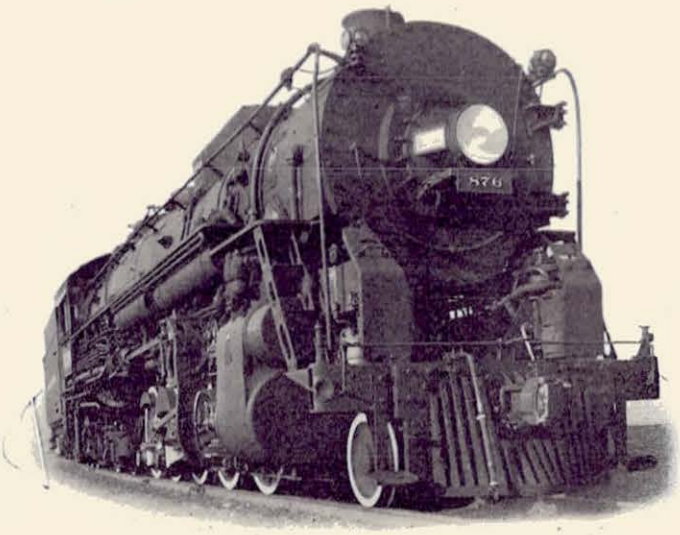
# Revenue Earners



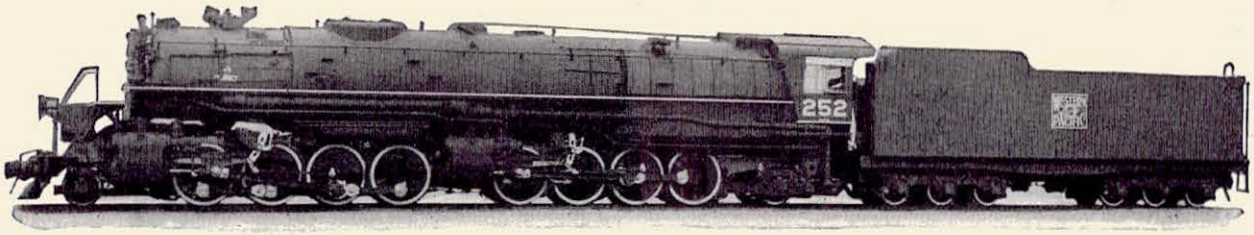
THE economies effected by the use of strictly modern power will pay for such locomotives well within their life-time — frequently in from 5 to 10 years. Only boiler horse-power and big drivers give Speed *and* Tonnage.

THE BALDWIN LOCOMOTIVE WORKS ★ 1831 1931

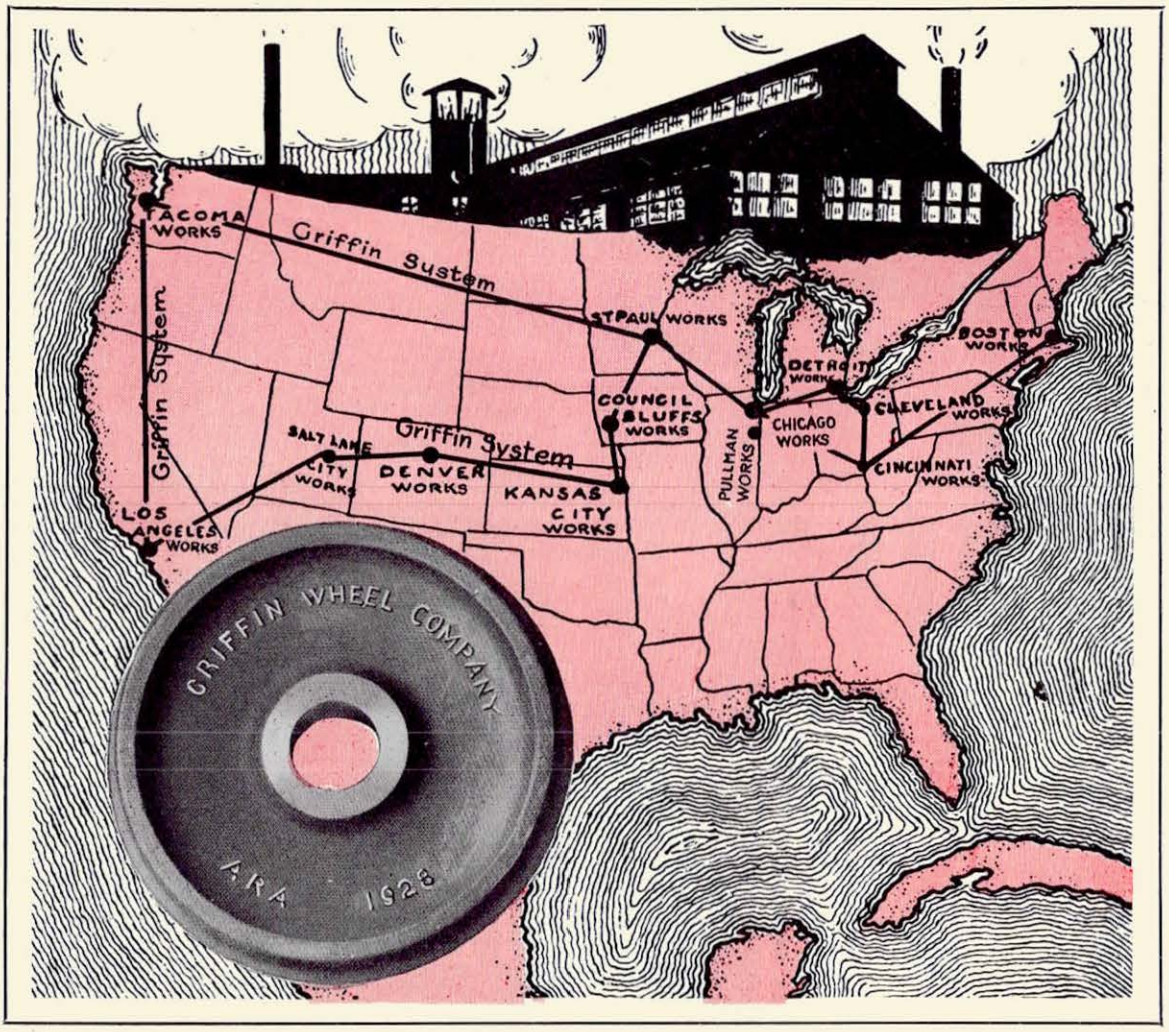
*It takes Modern Locomotives to make money these days!*

## THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA



THE GRIFFIN WHEEL COMPANY, WITH ITS THIRTEEN PLANTS LOCATED AT THE PRINCIPAL RAILROAD CENTERS OF THE UNITED STATES, ASSURES PROMPT, EFFICIENT SERVICE, SHORT HAULS OF BOTH NEW AND OLD WHEELS AND THE GREATEST POSSIBLE WHEEL ECONOMY.




# THE GRIFFIN SINGLE PLATE WHEEL

*Ideal For 70 Ton Capacity Cars And Fast Freight Service*

THE FOOD SUPPLY OF THE NATION IS CARRIED ON CHILLED TREAD WHEELS

# GRIFFIN WHEEL COMPANY

410 NORTH MICHIGAN AVENUE CHICAGO, ILLINOIS

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| Chicago | Boston | Cleveland | Kansas City | Denver | Los Angeles |
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# HEADFREE RAIL JOINTS

## REDUCE RAIL BATTER AND GIVE OLD AND WORN RAIL NEW LIFE

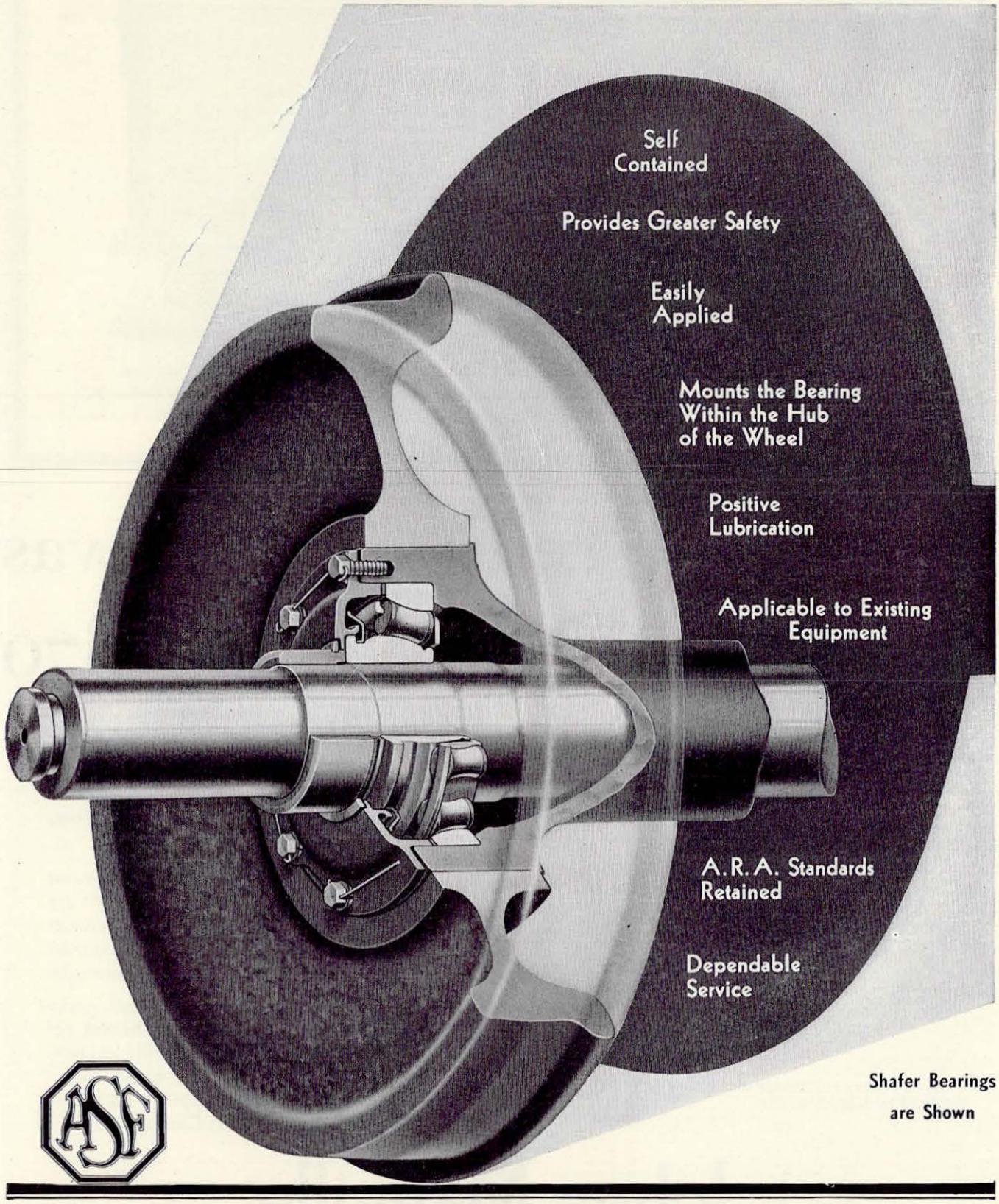
Sixty-nine railroads are buying Headfree Joints. Thirty-six roads have made them standard.

***There's a reason.***

THE RAIL JOINT COMPANY

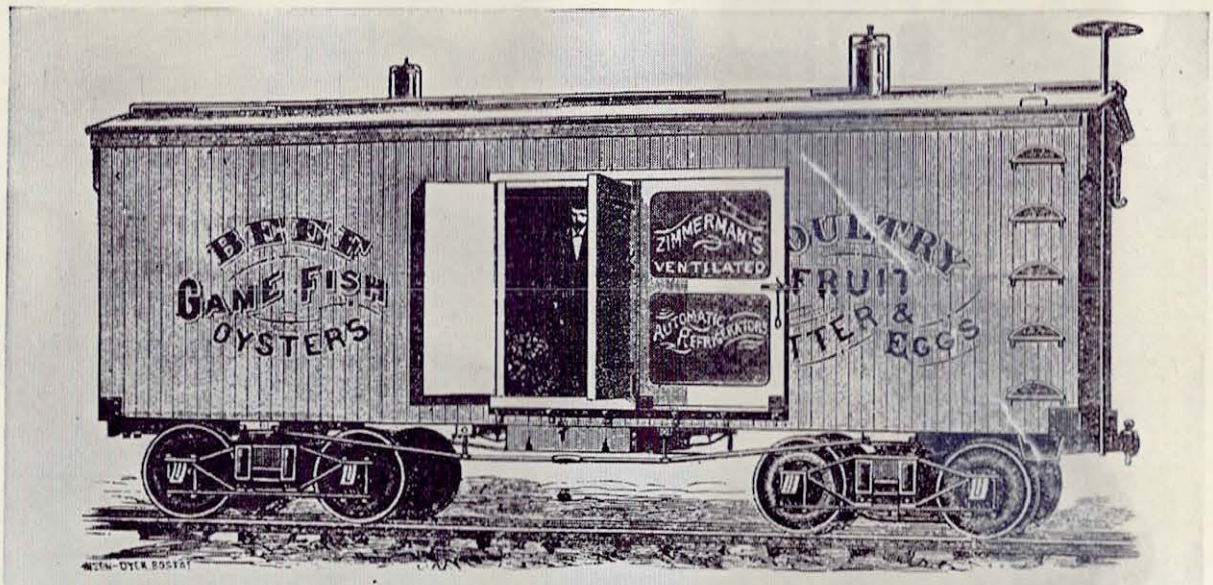
165 BROADWAY NEW YORK, N. Y.

# American Steel Foundries Roller Bearing Unit



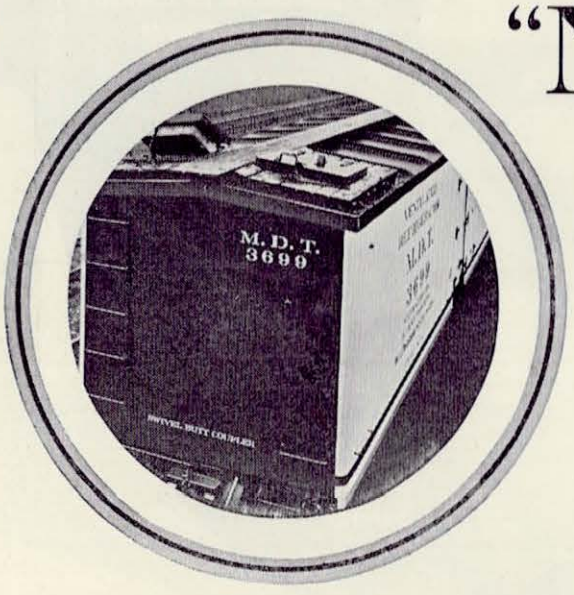

**AMERICAN STEEL FOUNDRIES**

NEW YORK CHICAGO ST. LOUIS




1870—It is claimed that this car was first to transport successfully dressed beef and pork, without spoiling. Patented ventilators attempted to provide air circulation without depositing soot on the food.

# Successful refrigeration was "NEWS" in 1870




1931—A modern refrigerator car insulated by Johns-Manville.

*Today, millions of freight miles are added to railroad revenue through the use of Johns-Manville Refrigeration Insulation.*

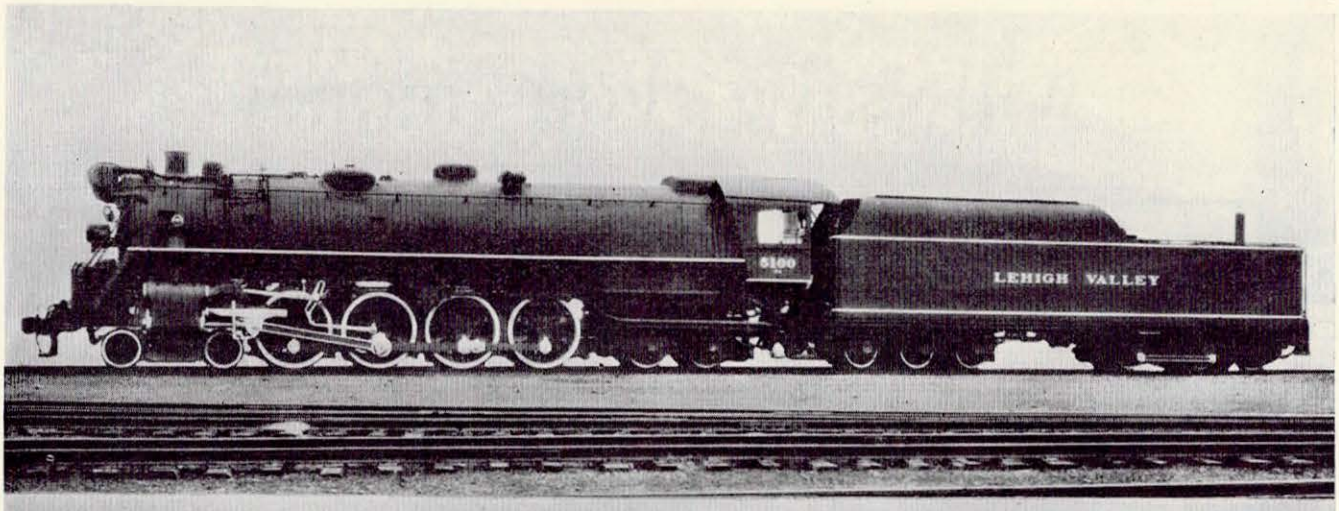
BACK in the early 70's, a shipment of dressed meat from the Middle West arrived in New York City unspoiled. The importance of this event was recognized by all farsighted railroad executives—it opened the way to additional sources of revenue to all railroads.

Today, refrigerator cars, efficiently insulated, make it possible to transport and preserve perishables regardless of time and distance. Johns-Manville has participated in this accomplishment to the extent of insulating more than 90% of the refrigerator cars now in service in the United States and Canada.

## Johns-Manville

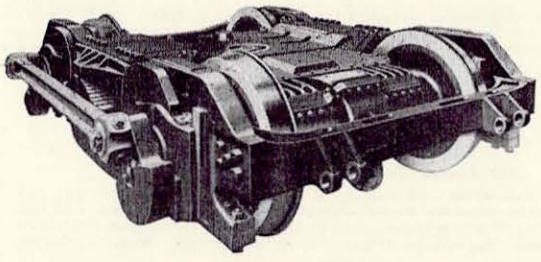
Service to Transportation

# Passenger ▪ Fast-Freight ▪ Slow-Freight ▪




# ALL THE SAME to the High-Wheel Engine with an AUXILIARY

**The combination of a high-wheel engine and a Bethlehem Auxiliary Locomotive offers operating economies that are worth the most careful consideration by railway executives. The added tractive force provided by the Auxiliary Locomotive makes the high-wheel engine much more effective in fast-freight service by enabling it to start and handle under difficult conditions a train heavy enough to utilize the full power of the engine at road speed. Similarly, in passenger service the Auxiliary greatly facilitates the starting and acceleration of heavy trains. The same engine is very effective in slow-freight service with the Auxiliary to furnish extra tractive effort for starting and getting over ruling grades. With this one type of locomotive available for all classes of service, capital investment in motive power may be very much reduced; further, it is not necessary to have so many locomotives waiting for their own particular tasks, with resulting reduction in standby losses.**



*The Bethlehem Auxiliary Locomotive is made in both four- and six-wheel types. It is readily installed in place of one of the tender trucks and can be cut in or cut out at will, thus providing an instantly available reserve of tractive force.*

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*General Offices:* Bethlehem, Pa.

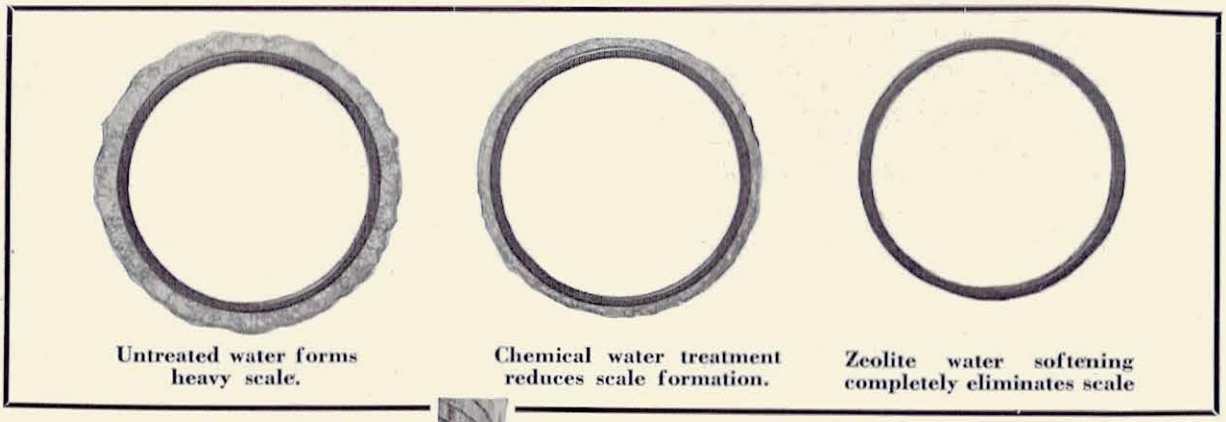
*District Offices:* New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland Cincinnati, Detroit, Chicago, St. Louis

*Pacific Coast Distributor:* Pacific Coast Steel Corporation San Francisco, Los Angeles, Portland, Seattle, Honolulu.

*Export Distributor:* Bethlehem Steel Export Corporation, 25 Broadway, New York City

# BETHLEHEM Auxiliary Locomotive

# Why ZEOLITE water treatment will save you money



**Untreated water forms heavy scale.**

**Chemical water treatment reduces scale formation.**

**Zeolite water softening completely eliminates scale**

***This shows graphically the effect of water treatment on the formation of scale on locomotive flues. Notice that zeolite is the only method (aside from expensive distillation) that completely* prevents *scale.***

OF THE 13,000 railroad water stations, only 1,300 of them have water treating equipment. This equipment is saving $12,000,000 annually.

90 per cent of the 13,000 stations have either no water treatment at all, or only some inefficient form of chemical dosage. All of the waters coming from these stations will form scale.

And every last bit of that scale can be kept out of locomotive boilers by proper water treatment. The Permutit Zeolite system, for instance, is guaranteed to absolutely prevent the formation of scale or sludge, since all materials which would form these deposits are removed from water *before* the water enters the boilers.

Think what that would amount to in dollars and cents!

Actual operating data show that Permutit Zeolite Water Softeners return from 30 per cent to 200 per cent of their cost annually. These figures are easily understood when you consider that the *prevention* of scale—not merely the *reduction* of it—removes the most frequent cause of locomotive failures.

Permutit Zeolite Water Softeners require but little attention, as unskilled labor can operate them. Maintenance is low and operation is positive. Regardless of fluctuations in composition of the raw water, scale-free water will be produced. Under-treatment or over-treatment is eliminated. Only small space is required, and the equipment can usually be housed in existing structures.

. . .

Write for "Soft Water for Railroads," which tells how one railroad has cut down its costs. A copy is free for the asking.

**THE PERMUTIT COMPANY**

*440 Fourth Avenue, New York, N. Y.*

**Manufacturers of Industrial and Household Zeolite Water Softeners, Hot and Cold Lime Soda, Lime-Barium Water Softeners—Sand Filters—Iron, Oil and Manganese Removing Filters—Continuous Boiler Blowoff Equipment—Ranarex $CO_2$ Indicators and Recorders—Other Power Plant and Water Treating Specialties.**

**Permutit** *Water Treating Equipment*

TWENTY-THREE SALES OFFICES THROUGHOUT THE UNITED STATES

# If you are seeking GREATER EARNING POWER from your freight cars . . .

WHEN you use Armco sheets and plates in the construction of your freight cars, you can look for decreased maintenance costs and consequently greater returns from your investment.

The reason is not hard to find. Precision marks the production of Armco sheets and plates — precision of analysis, precision of rolling on modern continuous mills, and finally, painstaking inspection for the slightest flaw or defect.

This scientific processing and constant watchfulness give Armco sheets and plates the qualities that cause shop costs to drop, that increase tonnage-miles, and step up the earning power of your freight cars.

We shall be glad to tell you more about the greater profit possibilities of Armco sheets and plates. Just address the office nearest you.

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RAILROAD PRODUCTS

MADE BY CONTINUOUS PROCESS

Special Car Siding Sheets
Locomotive Jacket Sheets
Freight Car Sheets and Plates
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Wrought Steel Wheels

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# ARMCO
## IRON AND STEEL
## SHEETS FOR EXACTING RAILROAD USES PLATES

# A *quick way to handle* More Freight *for* Less Money

PERHAPS you have been thinking that the Elwell-Parker electric way of freight handling calls for new methods, new truckers, new layouts—and goodness knows what.

Whether you are considering a single electric truck installation, or a fleet, dismiss now the thought that you will need to make any major changes in your present layout with Elwell-Parkers.

The same runways you now use for hand trucks, the same workmen, the same checking systems—everything fits into the Elwell-Parker way. Nor are there any costly changes in freight house construction or disruption of daily activities to consider because Elwell-Parker simply replaces brawn and muscle methods with the tireless energy of electricity. Within a few days, once you decide to go ahead, Elwell-Parkers can be operating—making profits for you from the very start. Reduced costs frequently pay for the entire initial investment in a single year.

An Elwell-Parker Field Engineer is ready and willing to study conditions at your terminals. He'll prepare an estimate of savings and follow through with drawings and specifications of the proper sizes and types of Elwell-Parkers for you to use. Write Elwell-Parker, 4250 St. Clair Avenue, Cleveland, asking the nearest E-P Field Engineer to call.

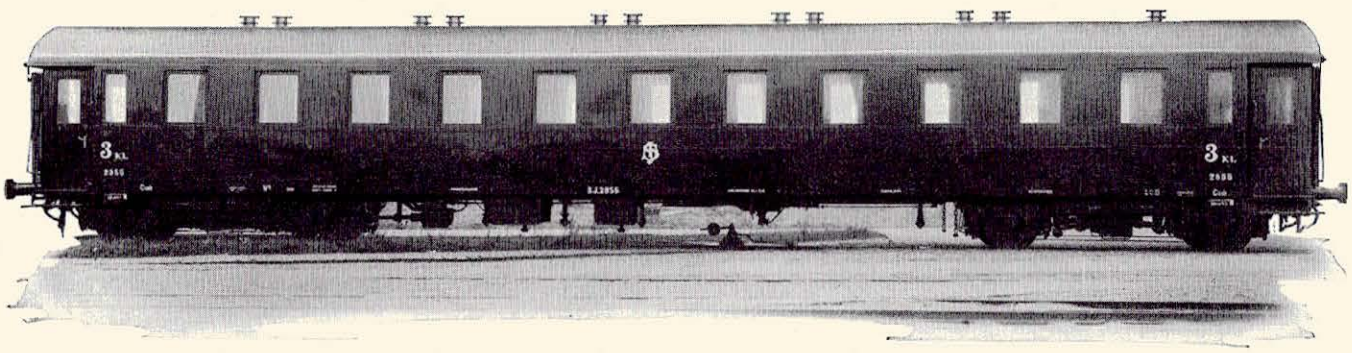
***Write for this Booklet, "Handling Freight at Lower Cost."*** It gives a complete, pictorial discussion of actual, cost cutting operations in many freight terminals. Many of these can be applied to your own operations.

*Handling freight for less money simply means moving bigger loads at greater speed with less manual effort. It pays.*

**ELWELL-PARKER**

**DESIGNERS AND BUILDERS OF ELECTRIC INDUSTRIAL TRUCKS, TRACTORS AND CRANES FOR OVER A QUARTER CENTURY**

# Balsam-Wool
## Passenger Car Insulation



*Suburban coach of the Swedish State Railways insulated with Balsam-Wool*

**MANY Swedish State Railways' steel passenger cars have been insulated with Balsam-Wool because of its light weight and unexcelled heat-stopping and sound-deadening qualities . . . Now — Balsam-Wool Insulation will be used in the luxurious new steel saloon car being built for His Majesty King Gustaf V of Sweden.**

**WOOD CONVERSION COMPANY**

Mills at Cloquet, Minnesota

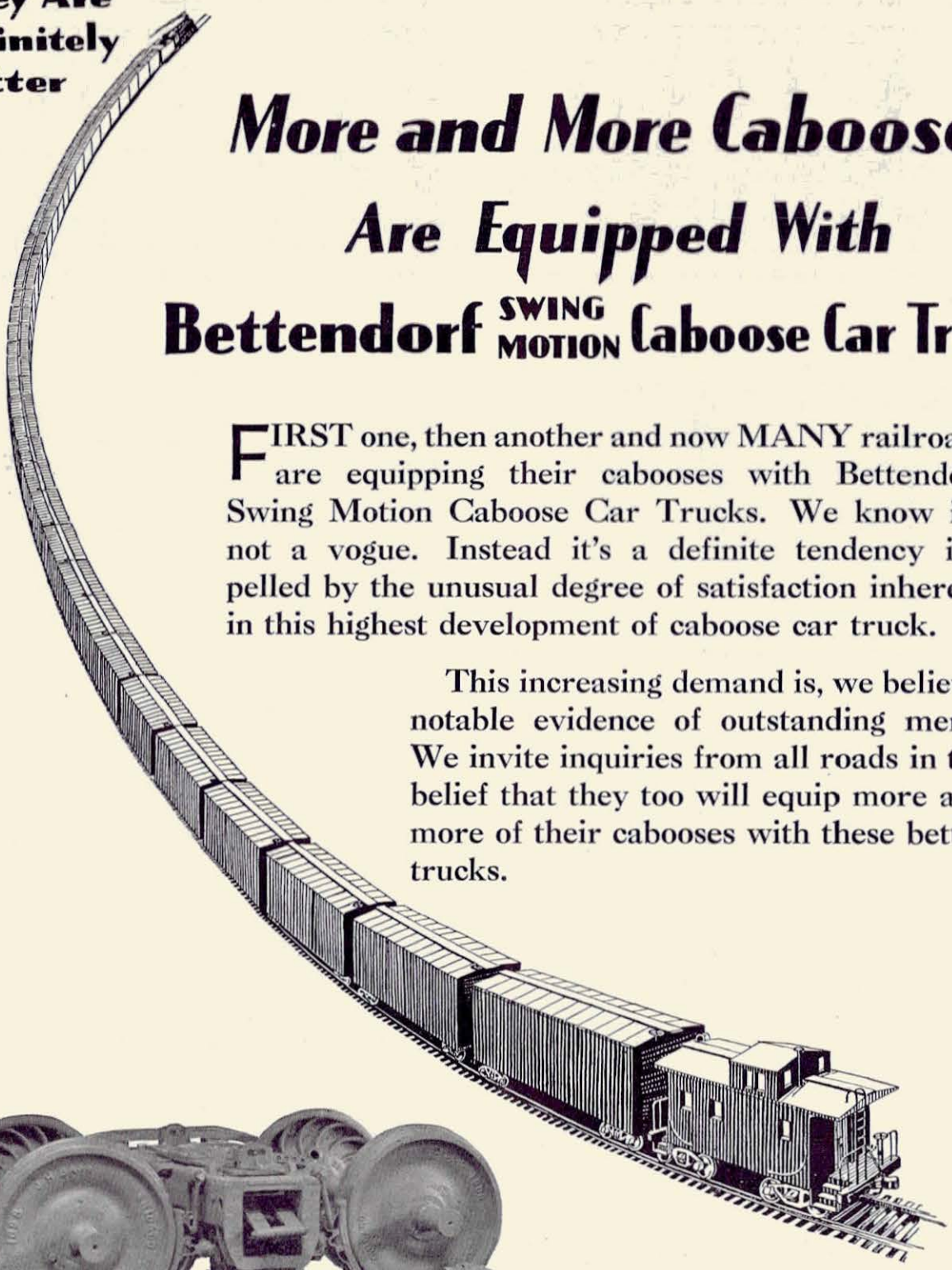
*Railroad Sales Offices:* CHICAGO — 360 No. Michigan Ave.; NEW YORK — 3107 Chanin Bldg.; DETROIT — 515 Stephenson Bldg.; SAN FRANCISCO — 149 California St.

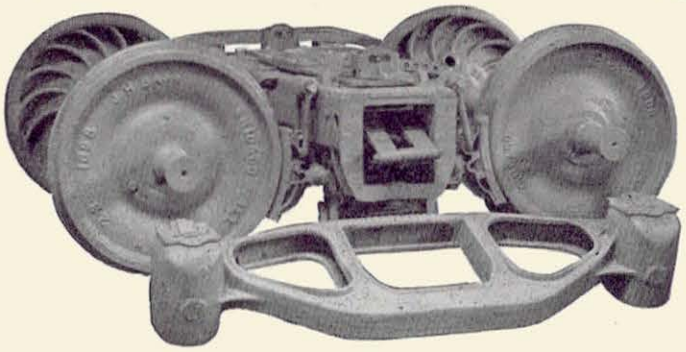
**They Are Definitely Better**

# More and More Cabooses Are Equipped With Bettendorf SWING MOTION Caboose Car Trucks

FIRST one, then another and now MANY railroads are equipping their cabooses with Bettendorf Swing Motion Caboose Car Trucks. We know it's not a vogue. Instead it's a definite tendency impelled by the unusual degree of satisfaction inherent in this highest development of caboose car truck.

This increasing demand is, we believe, notable evidence of outstanding merit. We invite inquiries from all roads in the belief that they too will equip more and more of their cabooses with these better trucks.

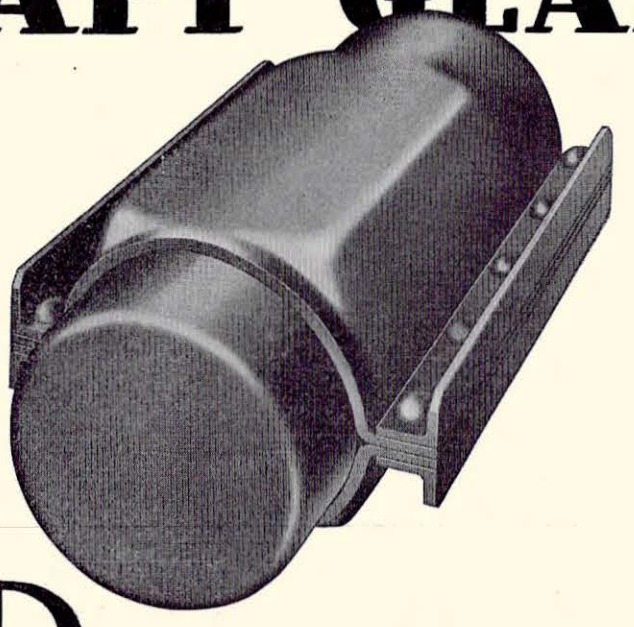




**THE BETTENDORF COMPANY**

OFFICES AND WORKS BETTENDORF, IOWA

# EDGEWATER DRAFT GEAR



# RELEASE

A draft gear should provide protection not only for a single impact, but for successive impacts. If the gear is to be always ready it must release quickly and positively after impact.

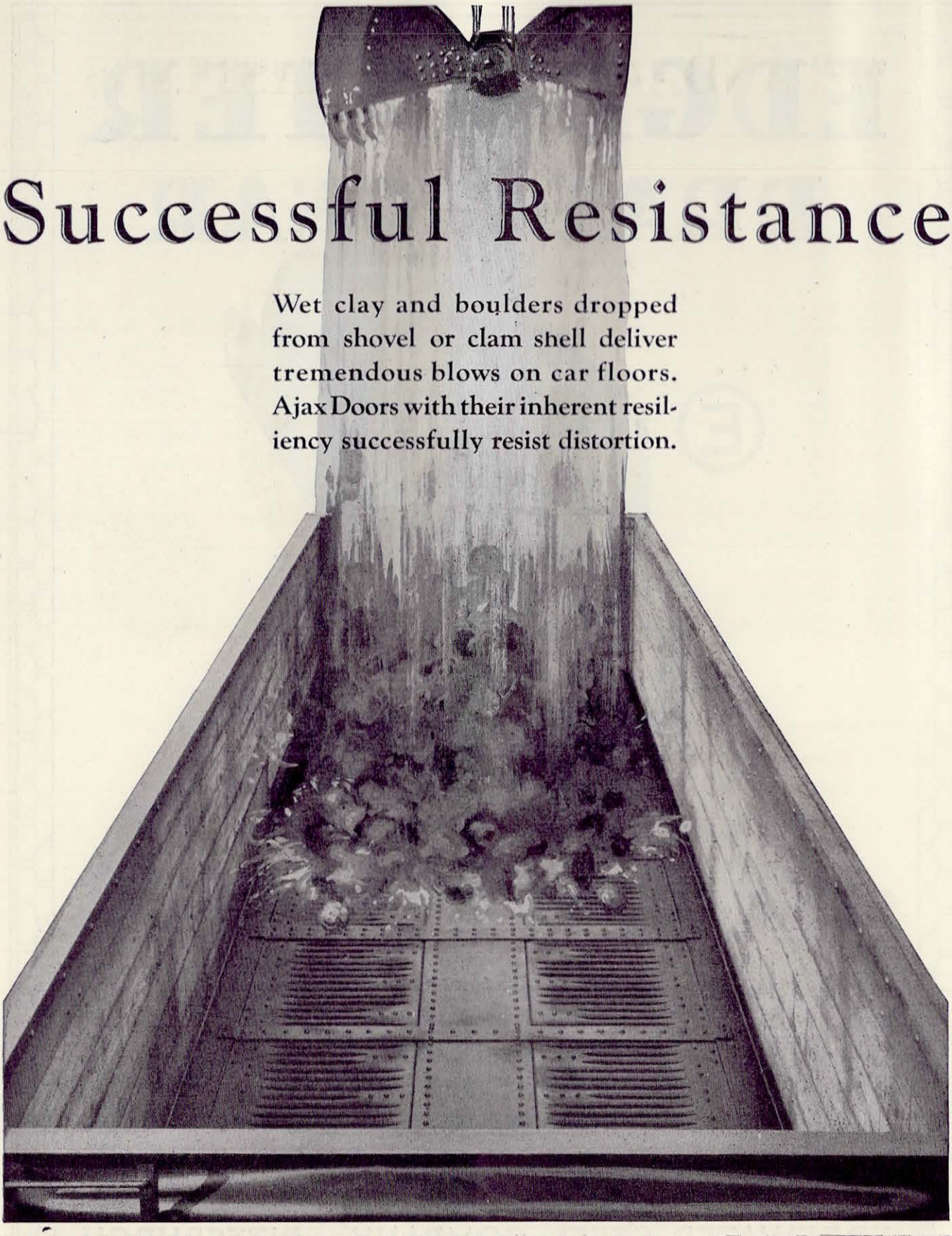
The ring spring action of the EDGEWATER Gear gives efficient release without injurious recoil. Tests show that the friction of the ring spring damps out vibration between cars. A surge through the train due to recoil is therefore impossible with the EDGEWATER DRAFT GEAR.

**EDGEWATER STEEL COMPANY · PITTSBURGH**

*Sales Offices:* ATLANTA BALTIMORE BOSTON CHICAGO LOUISVILLE NEW YORK PHILADELPHIA PORTLAND SAN FRANCISCO ST. LOUIS ST. PAUL SEATTLE WASHINGTON

# Successful Resistance

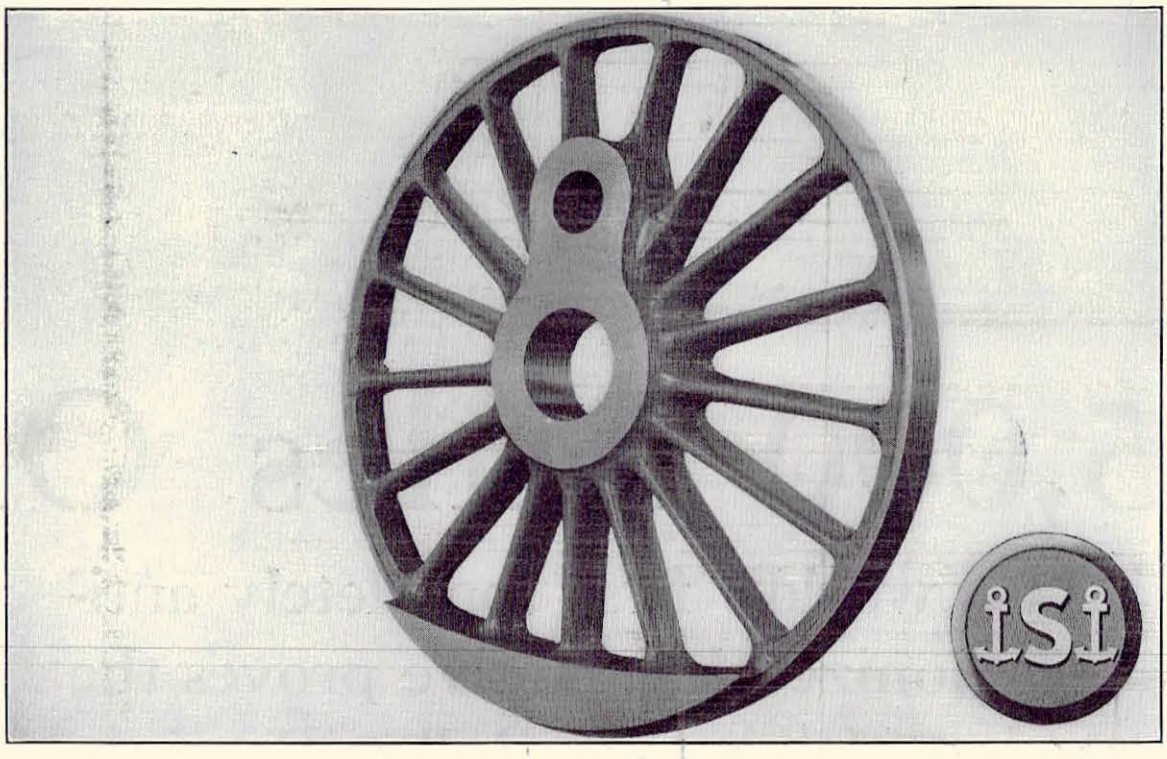
Wet clay and boulders dropped from shovel or clam shell deliver tremendous blows on car floors. Ajax Doors with their inherent resiliency successfully resist distortion.



**UNION METAL PRODUCTS COMPANY**

NEW YORK · CHICAGO · ST. LOUIS · WASHINGTON
RICHMOND · HOUSTON · SAN FRANCISCO · KANSAS CITY · MONTREAL

# "STANDARD" STEEL CASTINGS




## (Specification S-302-31)

EACH of these castings are microscopically tested before being shipped. The new specification makes an ideal steel for crossheads, wheel centers, driving boxes, cylinder heads and other miscellaneous castings. The steel is made by the acid open-hearth method, and after cooling below the critical range of temperature, is normalized and tempered.

| | | | |
|---|---|---|---|
| Tensile Strength ... | 85,000 lbs. | Elongation ..... | 22% |
| Yield Point ..... | 50,000 lbs. | Reduction ..... | 35% |

While this steel contains no alloys, it provides practically all of the properties of an alloy steel casting at but little more than the cost of our regular steel castings and at considerably less cost than an alloy casting.

+ + +

## STANDARD STEEL WORKS COMPANY

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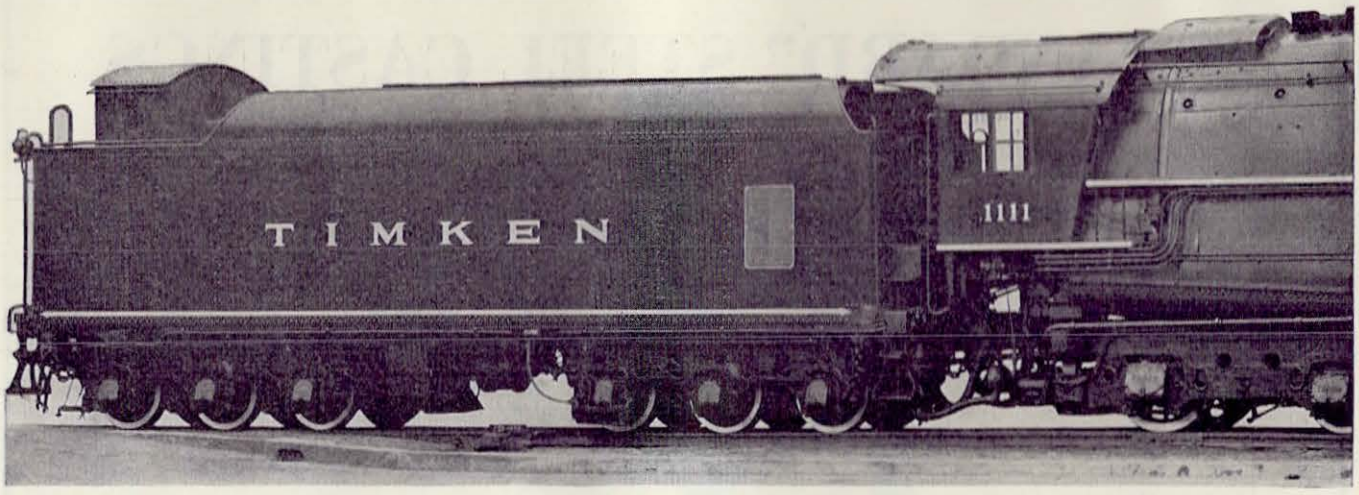
AKRON PORTLAND SAN FRANCISCO




# 75,000 Miles On

## The world's first completely anti-frictionized locomotive proves the value of Timken Roller Bearings in 16 months' service on 11 roads

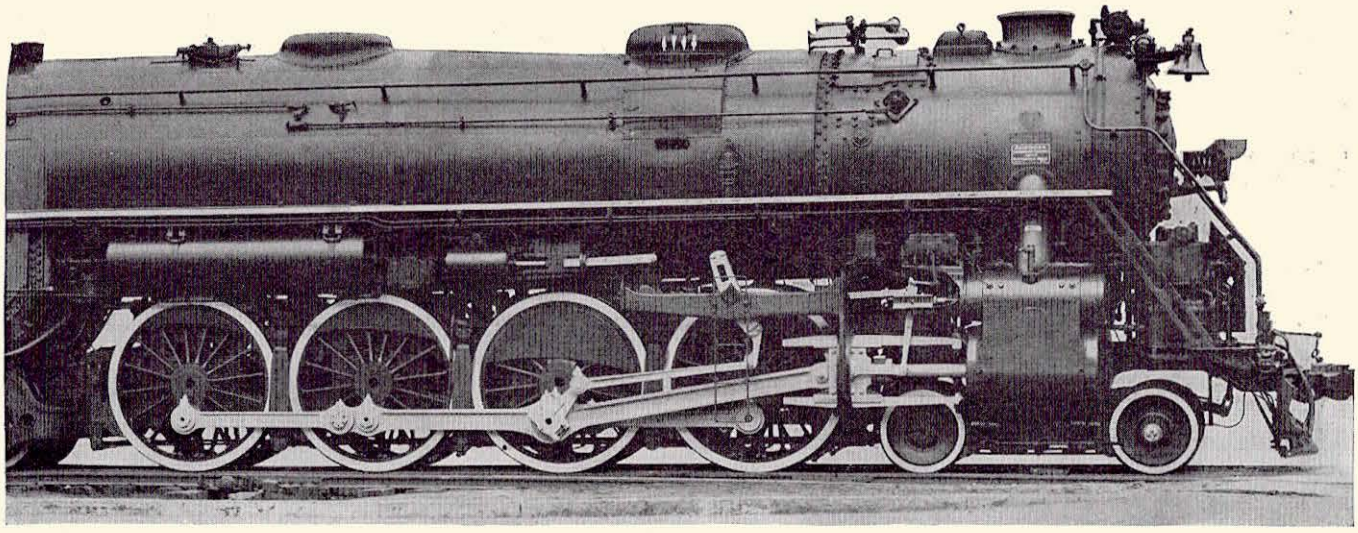
### *No trouble—no failures—no detentions*

Built by Timken to demonstrate the advantages of Timken Bearings in modern locomotive service, the Timken locomotive is at present the only completely roller bearing equipped locomotive in operation.

It will not have this distinction much longer, however, for Timken Bearings have so definitely proved their superiority that orders for other Timken-equipped locomotives have already been placed by one leading railroad.

Timken Bearing service has been entirely free of trouble. Furthermore there has been no failure or breakage of contingent parts such as springs and spring hangers. There is no other bearing manufacturer in the world who can make that statement.

**TIMKEN** ***Tapered Roller***



# Timken Bearings

The service record of the Timken locomotive to date follows:

1. Timken locomotive completed April 15, 1930.
2. In service 16 months.
3. It has operated on the following railroads: New York Central, Pennsylvania, Chesapeake & Ohio, Erie, New York, New Haven & Hartford, Boston & Maine, Delaware, Lackawanna & Western, Lehigh Valley, Nickel Plate, Chicago & Alton, Missouri Pacific.
4. Has operated 75,116 miles.
5. Has operated in passenger service 33,957 miles.
6. Has operated in freight service 41,159 miles.
7. Has handled with ease 20 hour flyers in New York-Chicago service.
8. Has operated full tonnage freight trains of 90 cars at speeds of 60 MPH.
9. Has handled heavy coal drag weighing 9,985 tons at average speeds over the division of 23.8 MPH.
10. Has handled a total of (in freight) 116,614,013 gross ton miles.
11. Has handled all freight service at an average coal consumption of (including locomotive) 54.32 per 1,000 gross ton miles.
12. Has operated in all passenger service at an average coal consumption of 9.65 lbs. per passenger car mile.
13. Has operated entire distance of 75,116 miles at an average water consumption of 7.28 lbs. of water per lb. of coal.
14. Average speed in freight service (41,159 miles) 26.93 MPH.
15. Average number of cars per trip in freight 97.8 cars.
16. Average tonnage per trip in freight (including locomotive) 4,169 tons.
17. **Repairs on Timken Bearings—16 months, nothing.**
18. Times oil changed on Timken engine—16 months, 1.
19. The Timken Locomotive is the only complete roller bearing locomotive in the world.
20. Total number of American locomotives partially equipped with Timken Bearings, 227. These locomotives have rendered a service with freedom from bearing trouble that is unmatched in American railway experience.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

# BEARINGS

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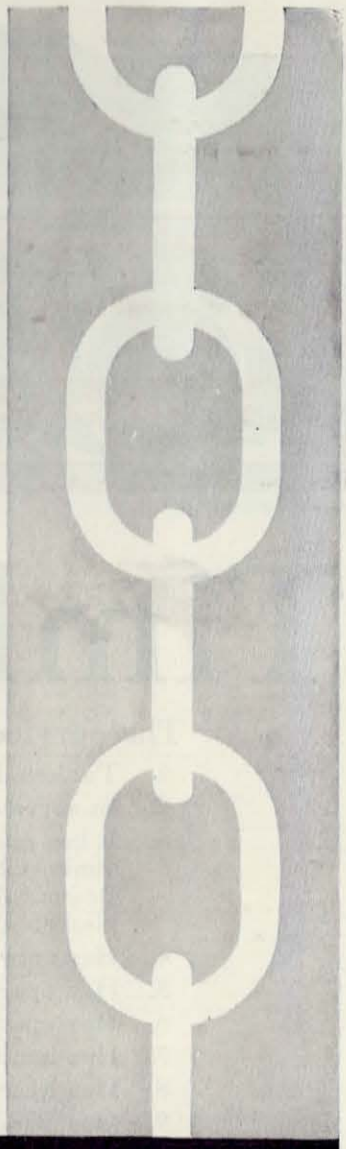

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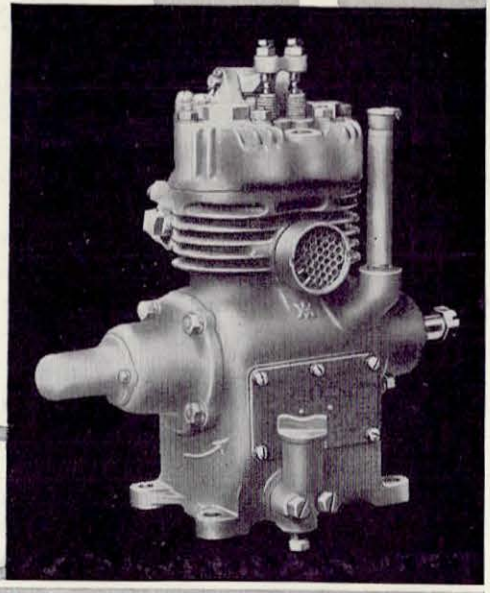

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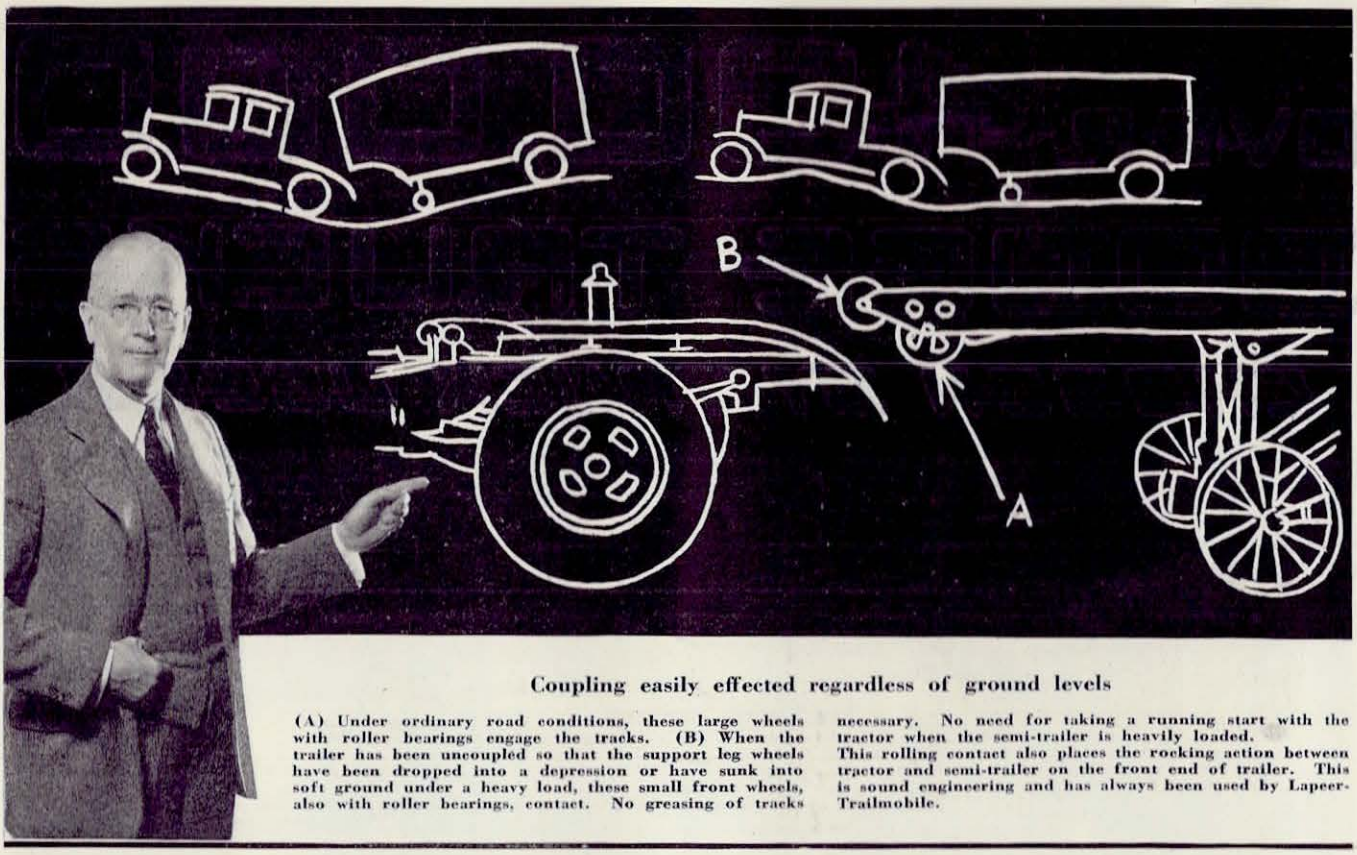


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**100% CAB CONTROL . . . *CHEAPER* . . . *FASTER* . . . *SAFER***

# POWER

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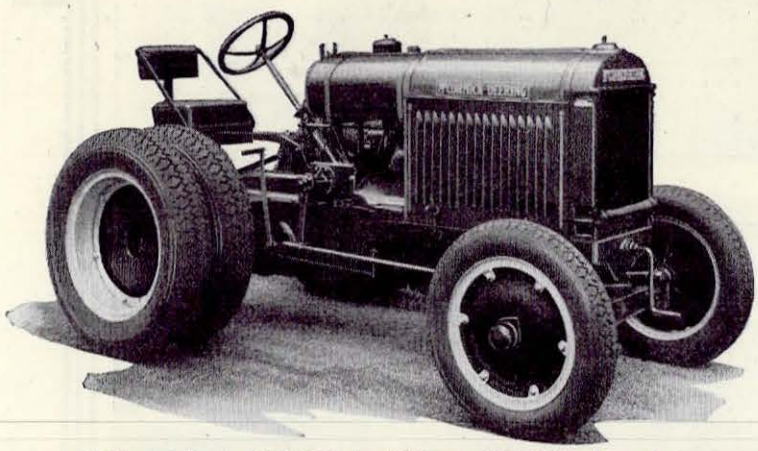

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THE VALUE of McCormick-Deering Industrial Power is in its application of economical power to a remarkable variety of work. It combines with equipment of sound engineering design to solve scores of power problems in railroad yards and shops, and in the handling and moving of stores and materials. Wherever it is at work, operations are speeded up and there are important savings made in time, labor, and money.

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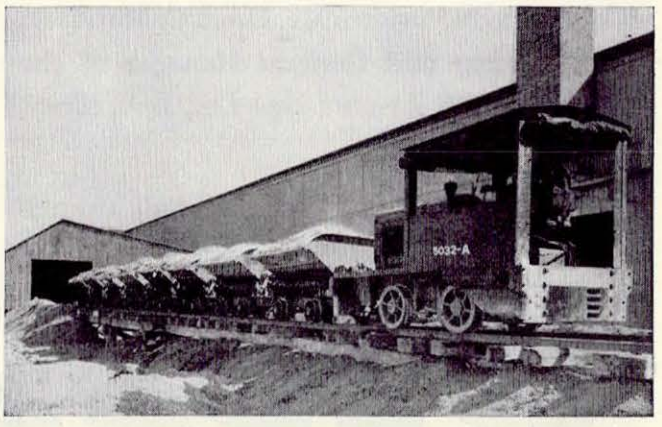
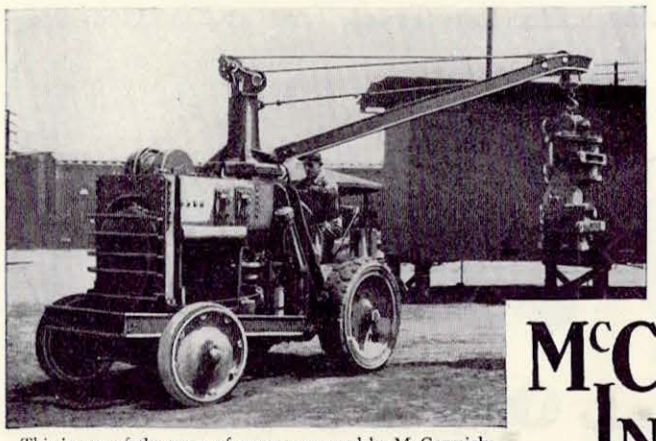
**INTERNATIONAL HARVESTER COMPANY**
**606 So. Michigan Ave.** **of AMERICA** *(Incorporated)* **Chicago, Illinois**

The McCormick-Deering makes an easy job of moving bulky pieces which are hard to handle by manual labor.



For many types of industrial haulage, the McCormick-Deering-powered locomotive effects important economies in man power and eqiupment.



This is one of the types of cranes powered by McCormick-Deering that is available for railroad work.

# McCORMICK-DEERING INDUSTRIAL POWER

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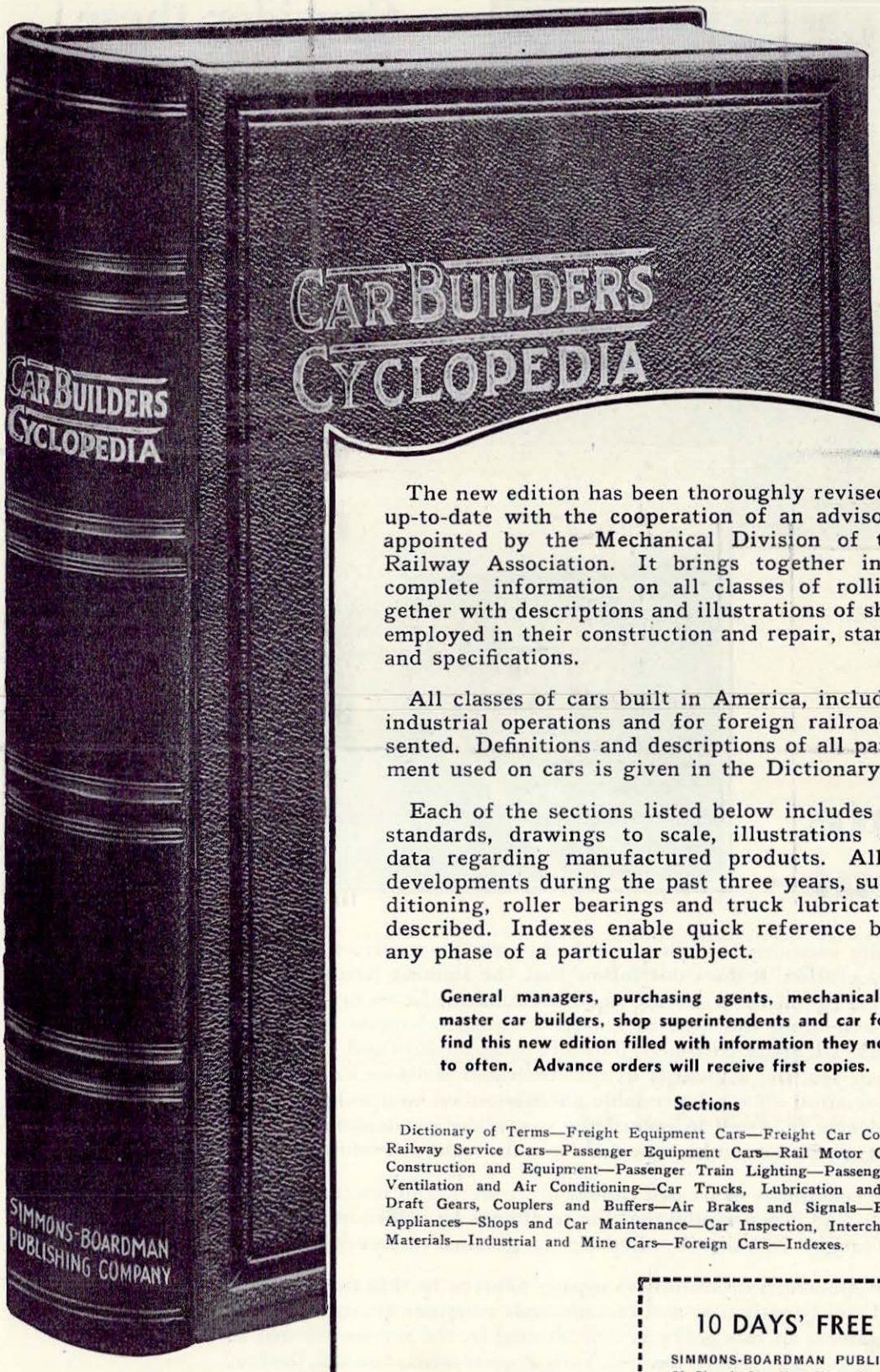


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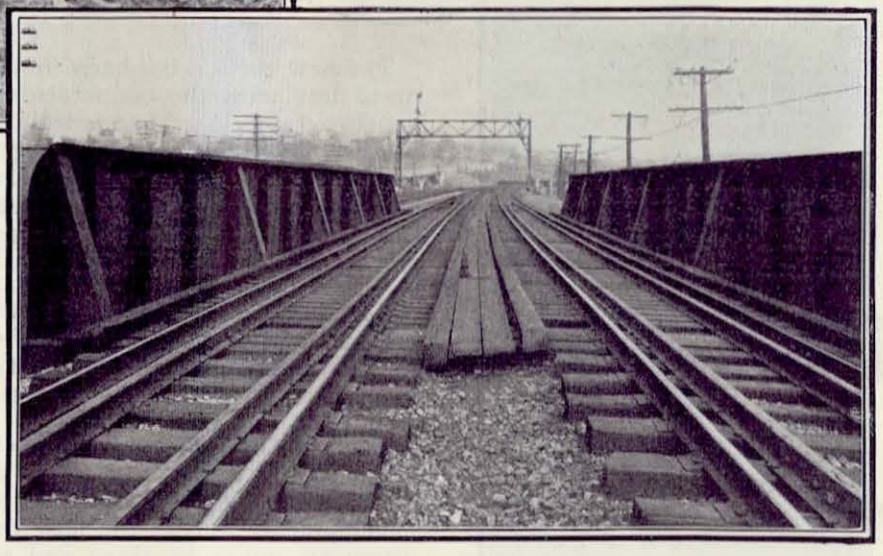

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# What Has Happened to the Railways?

The two years the railway statistics of which afford the most significant comparisons with those of 1931 are 1921 and 1929. Comparisons with 1921 are significant because, until 1931, it was the year of the most severe depression that the railways ever experienced. Comparisons with 1929 are significant because they show the extent to which earnings and expenses have declined during the present depression. Complete statistics of the earnings and expenses of the Class I roads for the first six months of 1931 are now available, and in the accompanying table they are compared with statistics for the first six months of 1921 and 1929.

In studying these figures it should be borne in mind that the first half of 1921 was the early part of the depression of 1921-1922, and that railway managements had then only begun to retrench to offset the declines of traffic and earnings, while the first half of 1931 followed fifteen months of steadily increasing depression and retrenchment.

In the first half of 1931 total earnings were 18.3 per cent, (or about $489,000,000) less than in the first half of 1921. The decline of freight earnings was 10.5 per cent, or about $196,000,000, and was due entirely to reductions of rates, as freight business was 6½ per cent larger than in 1921. The decline of passenger earnings was over 49 per cent, or about $283,000,000, and was almost entirely due to loss of traffic. Never in the history of American railroads, until the present depression, were their earnings less at the end of any decade than at its beginning.

**Revenues, Expenses, Etc., Class I Roads, first six months 1921-1929-1931**

| | 1921 | 1929 | 1931 | Per cent Decrease (or Increase) 1931 compared with 1921 | Per cent Decrease 1931 compared with 1929 |
|---|---|---|---|---|---|
| Oper. Revenues | $2,676,181,270 | $3,067,818,671 | $2,187,437,435 | —18.3 | —28.7 |
| Freight .... | 1,870,442,229 | 2,323,106,023 | 1,673,781,494 | —10.5 | —27.9 |
| Passenger ... | 574,939,925 | 431,047,863 | 292,163,226 | —49.2 | —32.2 |
| Oper. Expenses. | 2,363,343,960 | 2,249,486,144 | 1,716,774,190 | —27.3 | —23.7 |
| Transportat'n | 1,198,287,134 | 1,046,759,503 | 814,148,878 | —32.1 | —22.3 |
| Maintenance. | 1,012,235,609 | 1,017,780,886 | 729,588,277 | —27.9 | —28.3 |
| Taxes ..... | 133,396,337 | 197,041,738 | 164,738,626 | +23.5 | —16.4 |
| Net Oper. Income ..... | 145,485,019 | 562,729,734 | 238,550,140 | +64.0 | —57.6 |

Operating expenses in the first half of 1931 were 27.3 per cent, (or $646,000,000) less than in the first half of 1921, the reduction of transportation expenses being 32 per cent and of maintenance expenses almost 28 per cent. A reduction of more than 300,000 in the number of employees accounts for about 40 per cent of the difference in total operating expenses, the rest of it being due to other effects of increased efficiency and to declines in prices of fuel and materials. While operating expenses were about 27 per cent less in the first half of 1931 than in the first half of 1921, taxes were 23½ per cent greater.

The result of all these changes was that net operating income in the first six months of 1931 was 64 per cent greater than in the first six months of 1921, but it was steadily declining as compared with that of 1921, and in June was actually less than in June, 1921. Total net operating income of the Class I roads in the year 1921 was about $616,000,000, being relatively much larger in the second than in the first half of the year. No considerable improvement in net return has been occurring in 1931. If it should be relatively as small throughout the year as it was in the first half, it would total only about $541,000,000. This would be $76,000,000 less than in 1921, although the investment in railroad property is $6,000,000,000 more than it was then. Apparently only authorization of an advance in freight rates by the Interstate Commerce Commission can prevent the Class I roads from earning less than 2.25 per cent in 1931 as compared with 2.87 per cent in 1921, which, measured by return earned on investment was the worst year in railroad history until 1931.

### Comparisons with Past Depressions

The decline between 1929, most of which was a year of general prosperity, and 1931 in the earnings of the railroads was unprecedented in their history. Total

earnings in the first half of 1931 were $881,000,000 less than in the first half of 1929, a decline of almost 29 per cent. The loss of freight earnings was almost $650,000,000 and of passenger earnings about $140,000,000. Operating expenses were reduced $533,000,000, or almost 24 per cent, the decline in transportation expenses being more than 22 per cent and in maintenance expenses more than 28 per cent. Of the reduction in total operating expenses, approximately one-half was due to a curtailment of about 315,000 in the number of employees. Taxes declined $32,000,000 but this was due almost entirely to the decline in net earnings, upon which federal taxes are based. Net operating income declined from about $563,000,000 to about $239,000,000, or 57.6 per cent. In the first half of 1929 it represented a return at the annual rate of 5.54 per cent upon investment and in the first half of 1931 at the rate of 2.15 per cent. Total net operating income in 1929 was $1,275,000,000. Apparently it will be $735,000,000 less than this in 1931 unless the Interstate Commerce Commission authorizes an advance in rates, and thereby makes it relatively larger in the second half than in the first half of the year.

It would be difficult to say whether the statistics given regarding earnings or operating expenses are the more extraordinary. Comparisons are being made of the present depression with that of the early nineties. The decline of freight traffic in the year ended June 30, 1894, following the panic of 1893, which put many railroads into receivership, was only 14 per cent, and the decline of freight earnings about 15½ per cent. In the year ended June 30, 1895, freight business began to recover and total railway earnings were only 12 per cent less than in the year ended June 30, 1893. In 1921 freight business was 23 per cent less than in 1920, but in 1922 only 18 per cent less, showing that general business had begun to recover. During the last decade passenger business constantly declined, and freight business grew much less than formerly. In both 1930 and 1931 passenger business has continued to decline, and in 1930 freight business was 14 per cent smaller than in 1929, and in the first half of 1931 was almost 27 per cent less than in the first half of 1929. Following a decade of unprecedented decline of passenger business and of unprecedentedly slow growth of freight business, the present depression has been marked by relatively the greatest decline of passenger and freight business that ever occurred.

### Unprecedented Reductions of Expenses

Unprecedented reductions of operating expenses have been made to offset these unprecedented losses of traffic and earnings. In 1895 operating expenses were only 12 per cent less than in 1893, although their reduction was aided by reductions of wages. In 1922 operating expenses were only 23½ per cent less than in 1920, although their reduction was aided by reductions of wages. In the first six months of 1931 operating expenses were almost 24 per cent less than in the first six months of 1929, although their curtailment was not aided by any reduction of wages. The average number of employees in the first half of 1931, about 1,328,000, was the smallest since 1904. The severe reduction in number of employees undoubtedly has been largely due to the fact that wage scales have been maintained. Greatly reduced earnings necessitate proportionate curtailment of pay rolls, and if wages are maintained the needed curtailment of pay rolls must be secured, if possible, by reducing employment.

Only twice in the history of American railways has their freight traffic declined during two consecutive years—in 1914 and 1915, and in 1930 and 1931; and the decline in 1915 as compared with 1913 was only 8 per cent, while the decline in 1931 as compared with 1929 has been almost 27 per cent. This unprecedented decline of freight business is the principal immediate cause of the troubles of the railroads, but the long decline of their passenger earnings and unwarranted reductions that have been made in their rates are other important causes; and anyone who considers without prejudice all the influences to which they have been subjected during the last decade, and especially during the present depression, will feel no surprise that they have asked for a general advance in freight rates, whatever he may think of the expediency of such an advance.

## How Recover Lost Freight Traffic?

All the resourcefulness of railroad managements is now being directed upon the problem of discovering a means of stopping the loss of freight traffic to competitive motor trucks, and recovering traffic already lost. Different railroad officers have held different ideas as to the proper course to pursue, with the result that experimental efforts to recover traffic, which have been made in the past, have ordinarily differed from each other in one or more major respects. Out of these experiments, certain definite conclusions can now be drawn.

Recently the *Railway Age* addressed to railway officers, in charge of operations carried on for the purpose of recovering freight traffic from competitive motor trucks, an inquiry soliciting their personal opinions, based upon their experiences, as to what steps the railways must take in order to stop the loss of traffic to their highway competitors. In spite of the fact that conditions vary in different parts of the country, a significant uniformity of opinion is shown in their replies. Their fundamental conclusion is that the rates and service of the competitors must be met; shippers will not forego an opportunity to enjoy a somewhat

more convenient service or somewhat lower rates in order to patronize the railways.

An article in the Motor Transport Section of this issue presents the views of these railway officers in detail. Briefly, their conclusions are that store-door collection and delivery service must be provided; the rates must be no higher than those charged by competitive motor trucks; the rates should be governed by a classification much more liberal than the usual railroad classification; packing rules should be lenient and flexible; freight houses must be kept open to accept shipments up to a late hour in the evening; overnight service must be provided to points as distant as 250 to 300 miles, the average range of overnight truck service; and delivery must be completed immediately upon the arrival of the shipment at the station of destination.

Few problems as threatening to their welfare as motor truck competition for freight are faced by the railroads. With knowledge of the means by which shippers now utilizing motor truck transportation may be induced to become railway patrons once more, and with faith in their ability to defeat their competitors, based upon the experience of some railways which are already succeeding in that direction, the railways should go forward without delay toward the solution of this problem.

# Wider Experiment With Freight Containers

The opinion seems to prevail in some quarters that the various forms of unit freight containers are mutually antagonistic and that, if one design is adopted, others must necessarily be rejected. Is this view tenable after a full consideration of the facts? The large containers, which are adapted to either rail or highway movement and to easy interchange from one method to the other, are primarily designed to enable the railroad, with the truck, to give more economically the same general type of service which the truck offers by itself. A small container, however,—and by this we mean one equipped with wheels or casters and small enough so that it can be moved manually in a warehouse or store—would seem to fulfill an entirely different function, i.e., substituting for packing cases and facilitating intra-plant handling.

Neither the truck alone, nor the railroad alone, nor both together, offer a solution to the problem of intra-plant transportation which is a costly matter with many commodities. Moreover both of them, and especially the railroads, for many products require more or less elaborate boxing and crating, which would be unnecessary if the goods were loaded in small containers. There are commodities for which the freight car, unaided by any other device, provides ideal transportation service. There are others which can be more conveniently conveyed by a truck, or what is in effect its counterpart, the large container. But is there not still an important non-competitive field for a yet smaller unit which can be wheeled from the point in the factory where the product is completed to the shipping platform, and from the receiving platform to the consignee's shelves? Transportation, of some commodities at least, covers a much wider range than conveyance by railroad or even by railroad and truck combined. It begins in the interior of a factory and may end at a shelf in the middle of the tenth floor of a department store hundreds of miles away. The movement of a shipment from the middle of a plant to the point where it is loaded into a car or truck, and the movement at destination from the car or truck to the consignee's shelves is just as much a part of transportation as is the line or terminal haul. Likewise the cost of packing and boxing is quite as much a part of transportation expense as is the charge exacted by the railroad or trucking concern. If a railroad can offer its patrons a device which reduces their trucking, crating and plant handling costs, it favors them quite as much as it would by making a reduction in freight rates.

There is one field in particular in which a small, easily handled container would seem to offer great possibilities—that is in the retailing of meats and perishables.

These commodities now move under refrigeration to the station at destination but, in the case of perishables, are exposed to warm air in the movement from the railroad to commission houses and, finally, to retail stores. The losses due to this exposure to unconditioned air run into millions each year. Is there not a need for a small container which could be refrigerated so that perishables would be continuously protected from the time they are packed until the retailer places them in the consumer's hands? By eliminating wastage, would not such a device reduce the spread in price between the producer and consumer, thereby promoting the development of a greater tonnage of perishables?

In sum, is the container question one which can be satisfactorily answered by a single design? There is plainly a need for the larger types in connection with railway and highway co-ordination. Likewise a smaller model which can be moved by hand surely could be adapted to a wide range of profitable uses, without in any way competing with the larger types. Perhaps places could be found for other sizes and types. The idea is so promising in its many manifestations that experiment with it on a much wider scale than obtains at present seems one of the obvious steps which should be taken in the effort to keep the railroads in their position as the nation's primary reliance for freight transportation.

# Stronger Track Will Cost Less

Service records and painstaking investigation demonstrate the economies to be realized by heavier construction

Heavy Track Construction Is Responsible for Lower Maintenance Expenditures on the Lehigh Valley

THE railways of the United States can save more than $20,000,000 annually if they reduce their expenditures for new rail by 25 per cent. A reduction of this amount in the outlay for new rail can readily be secured if all the railways will apply all the measures that are being employed individually on various roads to extend the service life of rail. A further saving of at least an equal sum will be realized from proportionate reductions in the outlay for labor and track fastenings by reason of the less frequent renewal of rail, and the elimination of traffic interference occasioned by rail renewal operations. In addition, large reductions in track maintenance expenditures will accrue from the better and stronger track construction that will be provided.

Among the effective measures that will be productive of economies in direct proportion to the extent of their application are the use of heavier rail sections; the building up of battered rail ends by oxy-acetylene or electric welding; the heat treating of the rail ends, both new and after building them up, to increase the resistance to batter; the installation of curve oilers to reduce the head wear on curves; the use of better designed joints and the building up of worn joints to provide better support for the rail ends; and the systematic checking of rails in track for internal defects, thereby obviating the necessity of taking out of track rails of heats that are under suspicion because of defects in other rails of these heats. In the same general category, the use of larger and better designed tie plates and especially the attachment of these plates to the ties with lag screws promise reduced destruction of the ties.

### Economy in Larger Rail

To be specific, the replacement of 85-lb. rail with rail weighing 137-lb. per yard will result in a net saving of $123 per mile of track per million gross ton-miles of traffic. This is the conclusion reached as the result of an extensive study and a series of field tests completed about a year ago by the Kansas City Southern on a portion of its line which carries a traffic averaging about seven million gross tons annually.

The report of this investigation, which was abstracted in the *Railway Age* of May 24, 1930, page 1231, appeared at a most opportune time, for never before have railway managements assumed a more critical attitude toward the track structure, or have they been more keenly interested in developments that promise reductions in the outlay for upkeep and renewal. The results of the Kansas City Southern's investigation serve also to confirm in a concrete way the conclusions reached by the Lehigh Valley with respect to the economies that will accrue from heavier track construction, for the Lehigh Valley, in adopting the 136-lb. rail as standard in 1915, definitely discarded established precedents with respect to the relationship of rail section to traffic handled. Because this road has also maintained leadership in the use of labor-saving equipment, and has also taken an advanced position with respect to the strengthening of other features of the track structure, it is difficult to determine with any great degree of accuracy to what extent the use of heavy rail has reduced track maintenance costs. It is significant, however, that the cost of track maintenance per mile of track on this road was reduced from $1520 in 1921 to $1100 in 1929, that man-hours of section labor per mile of track maintained were reduced from 2000 in 1921 to 660 in 1929, and that, in spite of its greater weight, the average number of tons of rail laid per year have been less since the 136-lb. section was adopted.

While it is true that several railways, especially the Pennsylvania, the Chesapeake & Ohio and the Norfolk & Western, adopted 130-lb. sections for lines carrying exceptionally heavy traffic as early as 1916 and 1918, the railways as a whole manifested a reluctance to break away from established standards. Thus, as recently as 1921 only 8805 miles of main tracks on Class I railways were laid with rails weighing more than 100-lb., of which only 2654 miles embraced rail weighing 130-lb. or more. However, the record of the last 10 years

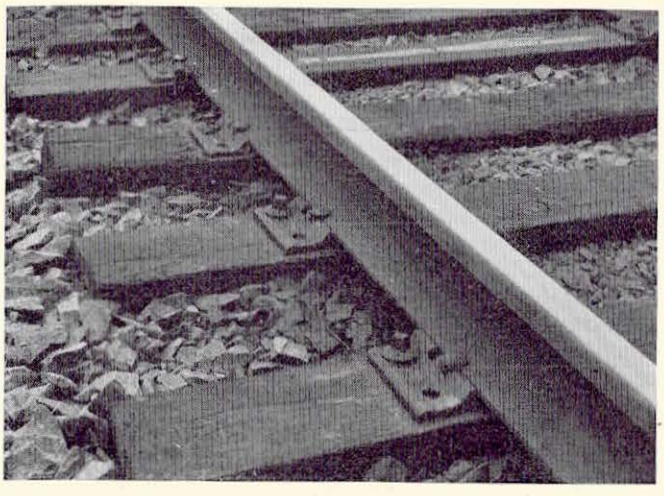
affords conclusive evidence of a growing realization of the economy of stronger track, for by 1929, the last year for which figures are available, the mileage of track with rail weighing more than 100-lb. had increased to 38,399, while that laid with rails weighing 130-lb. or more totaled 14,748. Considering the Western lines alone, the contrast is more outstanding, for in 1921 there were only 20 miles of track west of Chicago with rail weighing more than 100-lb., while in 1929 there were 7353 miles of 110-lb. rail, and 576 miles of 130-lb. rail.

### Still Far To Go

These figures serve to show the trend, but in the light of the conclusions of the Kansas City Southern, they represent only a beginning in the movement toward heavier track. This is brought out in the chart of mileages of track laid with various weights of rail, where it will be observed that rail weighing 110-lb. or more comprise an exceedingly small part of the total. Obviously, there are great mileages of branch lines for which rails weighing 100-lb. or less are ample, but there are still extensive mileages of main line tracks laid with 85-lb., 90-lb. and 100-lb. rail which are carrying a volume of traffic that the experience of other lines demonstrates as adequate justification for the use of much heavier rail.

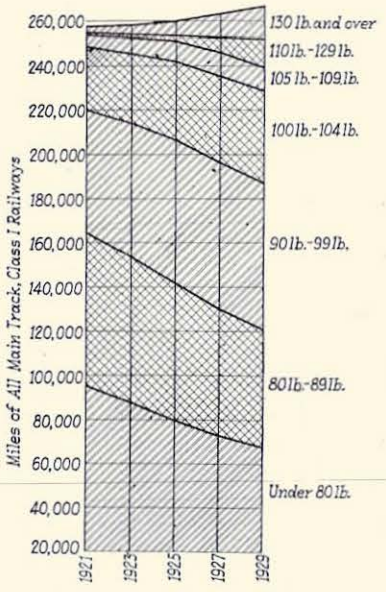
That the opportunities for greater economy in track maintenance are not confined to the adoption of rails of 110-lb., 127-lb. and even 130-lb. sections in tracks now laid with much lighter rails is evidenced by the recent adoption by the Pennsylvania of a 152-lb. section. Other railways with lines subjected to much more than average traffic density will find economy in rails of proportionate weight.

The adoption of heavier rail is, however, only one element in any program for the development of a track structure that is stronger and stiffer and that will therefore require less maintenance expense. In fact, the life of the rail on tangent track, regardless of its weight, depends very largely on the deterioration of the ends—manifested as batter of the running surface, chipping of the ends of the head, and wear of the fishing surfaces. While by no means a cure, the use of joint bars of good design, forged from heat-treated steel and applied with heat-treated bolts, are deemed an essential of good practice. It is true that joints evolved up to the present fall considerably short of the ideal, but improvements are constantly being made and it is up to the railways to avail themselves of the best in the interest of rail conservation. That joints are not just joints is clearly shown by the fact that rail with one type of joint is said to have handled twice as much tonnage as the same weight of rail with another type of joint had carried in the same location.



Tie Plates on the Delaware, Lackawanna & Western, the Pioneer in Better Tie Plate Practice

Likewise, devices for retaining bolt tension are constantly being improved and service records indicate that longer service will be secured from rails equipped with the most effective types of washers or springs. A new process of considerable promise, although still in the experimental stage, is the use of the oxy-acetylene torch to heat-treat the running surface of the rails within the limits ordinarily subject to joint batter for the purpose of obtaining a degree of hardness approximating the case hardening that results from the cold rolling effect of traffic.




Progress in the Movement Toward Heavier Rail, 1921 to 1929, as Shown by the Mileage of Rail of Various Weights in Main Track of Class I Railways

### Joint Maintenance

The operating economies to be realized by prolonging the life of rail may be had only in part as a consequence of adequate design and construction. Much depends on maintenance, and of all measures that can be applied, the restoration of the running surface by autogenous welding is the most beneficial. It has been most extensively applied, but the ultimate development has by no means been realized. According to the report of a survey of this practice made in 1926, this process had then been applied to more than two million joints on 124,000 miles of track and its use has been greatly extended since that time.

The effectiveness of both oxy-acetylene and electric welding varies with the condition of the rail at the time that the work is done, as well as other conditions imposed. Therefore it is to be expected that reports with respect to the increase in the life of rail that has been obtained will be subject to wide variations. Under average traffic conditions the gain in life approximates three years, with a minimum of two years and a maximum of six years. It is anticipated, however, that even better results will be obtained from more recent work as a result of a gradual refinement in practice. Until such time as the battering of joints is prevented, the building up of rail ends will not only remain a most profitable practice, but steps will be taken to conduct these operations on a more thoroughly established routine under which welding will be done on rails that need it in due course rather than to do it as an emer-

gency measure for the purpose of deferring rail renewals. This procedure will result in greater economy.

As a by-product of welding up rail ends, a new practice has been developed which should produce appreciable savings. This is the beveling or chamfering of the edge of the top of the rail at the joint. Because welders found it necessary to do this to insure an effective separation of the rail ends after welding, and because it was found that joints so beveled are less susceptible to end flow of the metal and subsequent chipping, this practice has been adopted on a few railways as a preventive measure. On some roads the chamfer is ground or cut when the rail is laid, on others it is done in the incipient stages of end flow. As it is generally conceded that chipping is one of the contributing causes of batter, resort to this simple method of reducing the tendency to chipping should save money.

Some railways are finding that measures to correct deterioration of rails ends must embrace more than the restoration of the running surface. The renewal of worn or bent joint bars often makes it possible to carry rail over for several years after it has been scheduled for replacement. In some cases the released bars themselves are restored with profit by re-forming and re-heat treatment. One advantage claimed for this process is the opportunity afforded to give the bars a camber whereby they will provide a better fit on old rails with worn fishing surfaces. A most recent development in this connection is the use of the oxy-acetylene torch to effect a re-forming of the joint bar in the field. Among advantages claimed for this process are the fact that it eliminates the element of transport to and from the shop, avoids the use of all but a small number of temporary or substitute bars, and, as the bars are replaced on the joints from which they were originally removed, insures a better fit. Still another and very simple means of restoring the fit of joint bars is the joint shim, a thin piece of sheet metal shaped to fit between the fishing surfaces of the rail and the bar and tapered toward the ends to compensate for the wear in the vicinity of the rail ends.

The judicious application of any or all of these measures for the conservation of rail, will result in large savings in rail renewals. It is worthy of special attention, that these methods of conserving rail are applied to the rail in track, thereby eliminating the charges for removal, transportation and replacement which are involved if the process is applied in a shop.

### Curve Wear

While the rail joint is the primary cause of rail deterioration on tangent track, head wear is of at least equal concern on curves. Within the last five years, however, devices have been developed for the lubricating of the high rails on curves which have been subjected to service use to an extent that has fully demonstrated their ability to effect marked savings in railway operation. According to records of wear compiled by two railways, head wear on curves that were oiled ranges from one-third to one-ninth the wear that took place before the rails were oiled.

While reduction in flange wear on wheels cannot be determined in most cases, one road estimates a reduction in locomotive wheel maintenance approximating $60 to $70 per year per locomotive. According to the A.R.E.A. Committee on Track, a reduction in the amount of regaging as a consequence of reduced wear results in increased life of ties. The reduction in friction has also made it possible to increase tonnage ratings, which in one case is said to have amounted to 10 per cent. As one lubricator, if properly maintained, will effectually lubricate 5,000 ft. of high rail, regardless of the track distance over which the curves are distributed up to a total of several miles, the cost of this protection for high rails on curves is inconsiderable. As a further evidence of the effectiveness of this equipment, one railway has purchased 65 of these lubricators within the last two months as an emergency measure to enable it to carry over a considerable mileage of rail that would otherwise have to be renewed this year.

### Intermediate Manganese Rails

The movement for greater strength and stiffness of rails is of no greater significance than the demand for rails of better quality, as evidenced by the program recently adopted by the A.R.A. in collaboration with the rail manufacturers for an exhaustive study of the entire subject. While this investigation is concerned primarily with the cause or causes of the transverse fissure and is now still in the preliminary stages, contemporaneous measures for improvement in rail quality point to opportunities for savings through the attainment of longer life. According to the report presented by the Rail committee of the A.R.E.A in March, well over 650,000 tons of intermediate or medium manganese rails are now in service and it is the conclusion of the committee that this type of rail will have longer life because of its greater resistance to wear. It is believed also that difficulties in the way of split-heads experienced with certain lots of these rails were due entirely to irregularities in metallurgy and manufacture that can readily be corrected by minor changes in practice.

That the railways have been willing to spend money for lots of this experimental rail is evidence of the interest being taken in projects for better rail and therefore longer rail life.

### Avoiding Needless Renewals

The subject of rail cannot be dismissed without reference to one practice of recent origin, although it is prompted by other considerations than economy alone. This is the exploration of rail for internal defects with the detector car. While the use of this equipment is primarily a safety measure to make it possible to remove defective rails from track before they are fractured in service, it serves also to obviate the necessity of removing from the track, as is the practice of most railways, all the rails of mill heats that are under suspicion because of the discovery of transverse fissures in a few of them. The expense of such operations, together with the cost of maintaining the elaborate records that are necessary to insure that the location by heat numbers of all rail in track are of such a magnitude that their elimination will offset, in considerable part at least, the cost of detector-car operation.

### Bigger and Better Tie Plates

The use of the tie plate as a measure of economy may seem to offer small opportunities because this important track accessory is already in general use, but in view of the developments of the last three years it is evident that the field for further economy from this source is still a large one. It had been apparent to maintenance officers for some time that the tie plates in use on many roads were not proving fully effective in the service for which they were provided, namely, to protect the tie from mechanical injury, while it was obvious that many plates were of such limited dimensions as to cause bearing pressures in excess of the crushing strength of the wood.

Some railways on the other hand, have been securing excellent results for years, but it was not until the appearance of the monograph by Dr. Herman Von

Schrenk on the wear of ties in June, 1928, that track maintenance officers as a whole came to realize the full significance of the function of the tie plate. This has had a far reaching effect and is resulting in a much more extensive and intelligent utilization of tie plates.

It has been shown that the tie plate has two functions —to distribute the load over an adequate area of the tie to avoid bearing pressures in excess of the crushing strength of the wood, and to protect the tie from abrasive action resulting from the infinitesimal but constantly repeated longitudinal movements of the rail relative to the tie. These requirements not only call for plates of adequate dimensions but also for means of securing the plate rigidly to the tie—independent of the spikes that hold the rail. It is of particular interest that the excellent record of service life of crossties enjoyed by the Delaware, Lackawanna & Western has been ascribed in large part to the fact that the requirements of adequate tie plate design have long been incorporated in the plates used on that road. If other roads are to profit equally in the conservation of ties, they must spend more money for tie plates.

Some roads have recently revised their plans for tie plates for the purpose of making pronounced improvements in them and several manufacturers have developed new designs in which the principles outlined above have been embodied. The most common change is provision for the use of lag screws to hold the tie plate to the tie, separate holes being provided for the cut spikes that are generally employed to hold the rail. Other designs provide for entirely new methods of securing the rail. Mention may appropriately be made here of patented designs of track superstructure embodying heavy tie plates and track fastenings that result in greater lateral stiffness of the track than is obtained with conventional construction. The fact that several miles of track have been reconstructed to such designs on several railways, at a marked increase in the cost, is surely evidence of the willingness of railway managements to spend money for the purpose of reducing maintenance expenses.

### Switches, Frogs and Crossings

One of the large sources of track maintenance expenditures is to be found in the constant need for the replacement of special trackwork, including switches, frogs, and crossings. The outlay for this purpose has been reduced as a result of the extensive use of manganese steel in the fabrication of frogs and crossings and the general adoption of bolts made of high strength steel, as well as the improvements in design brought about through the co-operation of the Committee on Track of the A. R. E. A. and the Manganese Track Society. However, in spite of these advances in the art, and the general adoption of the improved materials and designs, outlay for renewals runs into large sums.

This has given rise to greater attention to the repair of trackwork, with the result that it is possible to extend the life of many units at a small outlay compared with the cost of complete replacement. At first this work was done in the field and consisted largely of the building up of open-hearth steel frogs and crossings by the same forces that built up battered rail ends. Later certain other firms specialized in work on manganese steel. The frog and switch manufacturers also have arranged to provide a repair service in their shops. Field repair has an important advantage in that it obviates the cost of transportation to and from the shop, while shop repair affords opportunity for complete overhauling and the benefits of plant facilities especially provided for such work.

Another source of economy is to be found in the more general use of the switch point protectors and switch guards, several makes of which are now on the market. These devices take the wear that is otherwise imposed on the switch point and their cost is inconsiderable as compared with the outlay for a new switch point.

### Rail Anchors

At a recent convention of the Roadmasters' Association, a committee report advocated the immediate application of rail anchors to new rail as one of several prime requisites for good results in rail laying. Nothing could illustrate better the thorough appreciation of the place of rail anchors as an integral part of the track structure. In spite of this, there is justification for the conclusion that the full benefits to be derived from them are now not always being realized. Owing to the inability to determine the magnitude of the forces responsible for the creeping of track, the determination of the number of anchors to be applied per panel of track has had to be based on judgment or experience rather than rational mathematical analysis This being the case, the officer of track maintenance has not always been able to present effective opposition to what in his opinion comprises an excessive curtailment of budgets for track anchorage. Because of such limitations on the number of rail anchors provided and because in too many cases the anchors have been applied uniformly according to some arbitrary rule rather than to vary the number in the light of the requirements of the individual stretch of track, the full possibilities of good practice in anchoring track have not been obtained in all cases.

A thorough study of rail creeping with particular reference to the adequacy of existing installations of anti-creepers will show that further economies may be effected through the application of a greater number of these devices than are now used in many cases.

Railway track today is better able to meet the demands imposed on it than at any other time in history. But any engineering structure that demands as much renewal and repair work as is required of present day track to keep it in condition for service is obviously far from perfect. And until every dollar has been spent for improvements that can be justified on the basis of lower maintenance expenditures, the track will not be the most economical structure for the purpose.

### In Next Week's Issue

A revolution is taking place in material-handling methods. It is a quiet revolution caused by the replacement of hand methods by motorized methods in the form of industrial tractors, crane trucks, lift trucks and other trackless power. These systems challenge the attention of railways because they can produce striking economies in railway stores, machine shops, roundhouses, car-repair yards, and freight houses, and out on the line by reducing the amount of labor required, by speeding up service and reducing switching and accidents, without entailing heavy capital expenditures or requiring supplementary expense. The railways have only begun to appreciate how these methods can help in attacking a vulnerable field of railway expense. The application of these methods to railway work will be discussed in next week's issue.

# Operating Methods Affect Fuel

## Coal consumption, considered with relation to train loading and speed

By R. A. Black

Engineer of Transportation, Canadian National

THE question of the effect of increased speed and heavier train loading on fuel consumption and train costs has occupied considerable of our attention for some time past. In this connection, the studies made on the Armagh subdivision of the Canadian National, as shown in the table, have a pertinent bearing.

When we consider fuel consumption in terms of "gross ton-miles per pound of coal" there is a very close relationship between fuel economy and economical train loading. Often there are other conditions such as traffic density, length of run, spacing of passing tracks, length of ruling gradients, and so forth, that must necessarily influence the establishment of tonnage ratings or train loadings, but, for the purpose of this article, the subject is approached purely from the standpoint of fuel economy.

A train is a unit made up of two components of varying quantities, when efficiencies are studied. The first component, the locomotive, is a machine capable of developing its greatest drawbar pull at low speed and of producing its greatest dynamometer horsepower output at some higher speed, depending upon its dimensions. The second component, the train, is a machine capable of being hauled over the rails most easily at the lowest possible speed, and with cars of the greatest possible weight. In the subsequent remarks, a Mikado locomotive with a rated tractive effort of 53,000 lb. will be considered, while the results of extensive tests by the Illinois Engineering Experiment Station, and published in the Bulletin No. 43, are used as the authority for our figures.

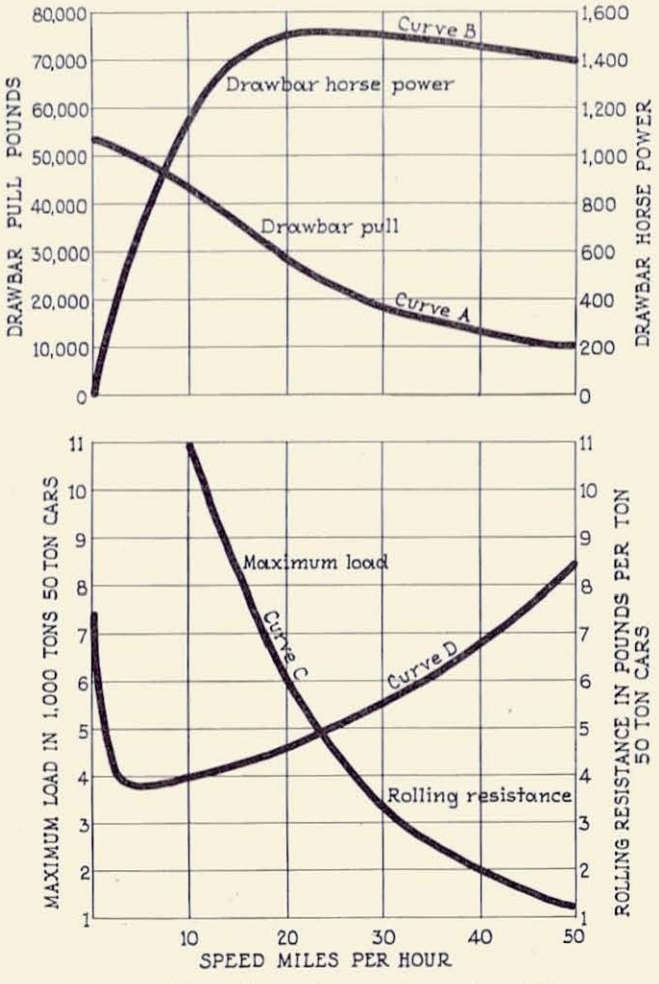



Fig. 1. With Mikado Locomotive on Level Track

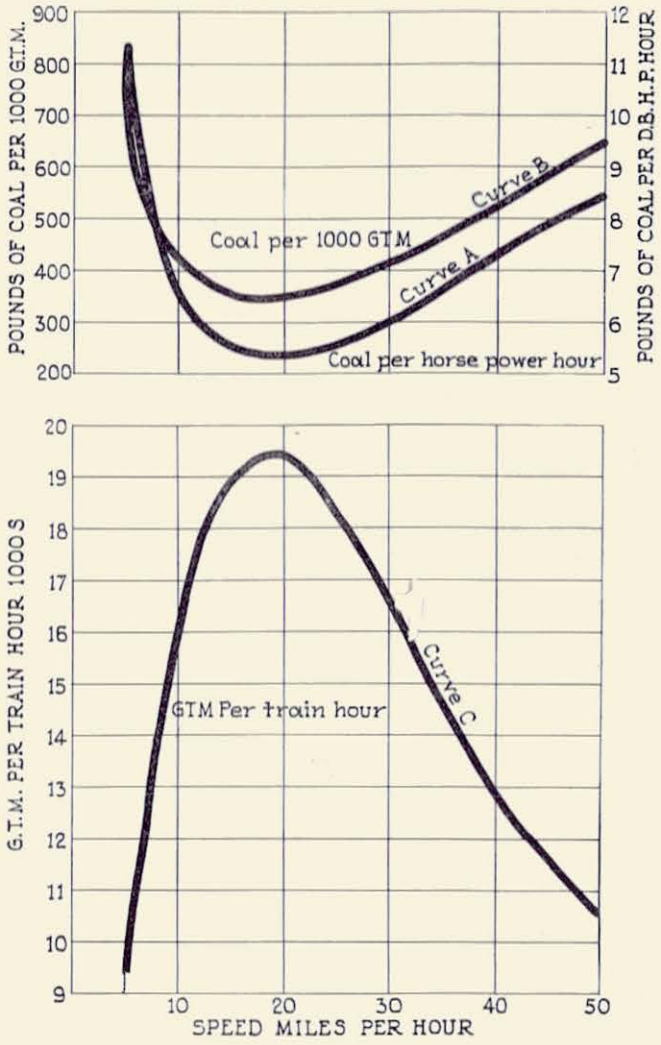

POUNDS OF COAL PER 1000 G.T.M.
POUNDS OF COAL PER D.B.H.P. HOUR
Curve B
Coal per 1000 GTM
Curve A
Coal per horse power hour
G.T.M. PER TRAIN HOUR 1000 S
GTM Per train hour
Curve C
SPEED MILES PER HOUR

Fig. 2. With Mikado Locomotive on Level Track

Since a locomotive is primarily the medium for converting the heat energy in coal into useful work at the rims of the drivers, it follows that what it can do must vary with the quality and quantity of the fuel consumed. A uniform consumption of 120 lb. per sq. ft. of grate

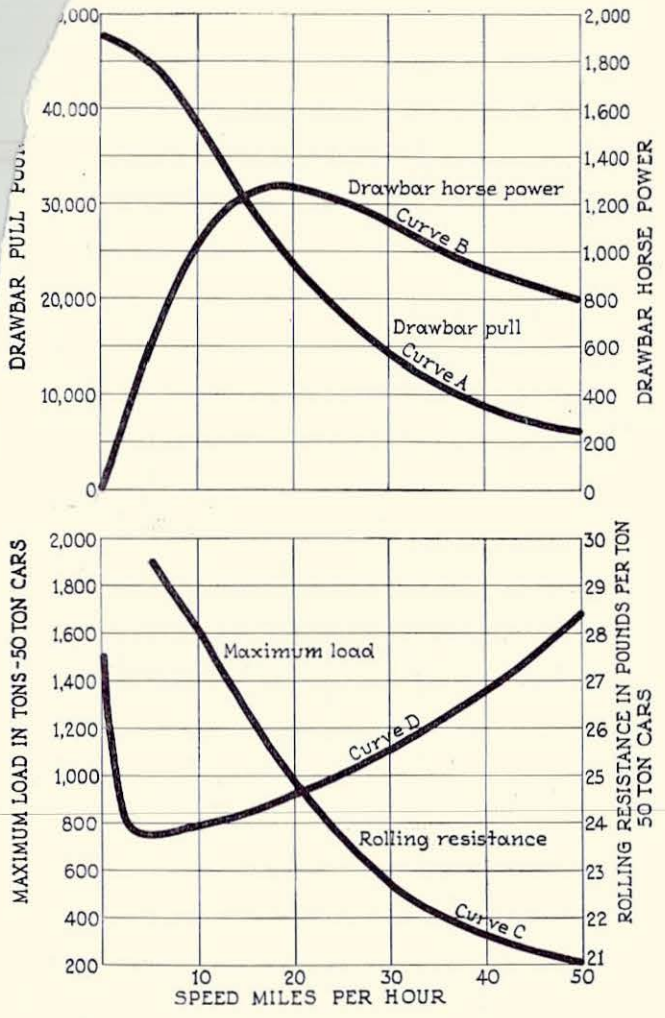



Fig. 3. With Mikado Locomotive on One Per Cent Grade

area per hour will be assumed, with coal having a thermal value of 12,000 B.t.u. Car resistances increase as the speed increases and are also greater per ton for lightly than for heavily loaded cars.

The possession of a dependable tractive effort curve is almost an essential in studying train loadings or tonnage ratings. On Fig. 1, Curve "A" shows the drawbar pull for the locomotive we are considering and is a composite developed from the results of numerous actual dynamometer tests, thus representing what may reasonably be expected under normal working conditions. Curve "B" shows the drawbar horsepower as computed from Curve "A". The rolling resistance per ton, for a train composed of cars with an average gross weight of 50 tons each, is represented by Curve "D," and the maximum load that can be hauled at the various rates of speed is shown by Curve "C." This latter is simply the quotient obtained when dividing the drawbar pull by the rolling resistance for any given speed.

Knowing the maximum load and the rate of speed at which it can be hauled, and having the assumed fuel consumption per hour, the quantity of coal per 1,000 g.t.m. is readily calculated and is indicated by Curve "A," Fig. 2. In like manner curve "B" represents the coal consumption per drawbar horsepower-hour.

Curve "C," Fig. 2, shows the maximum output, measured in terms of "Gross Ton-Miles per Train

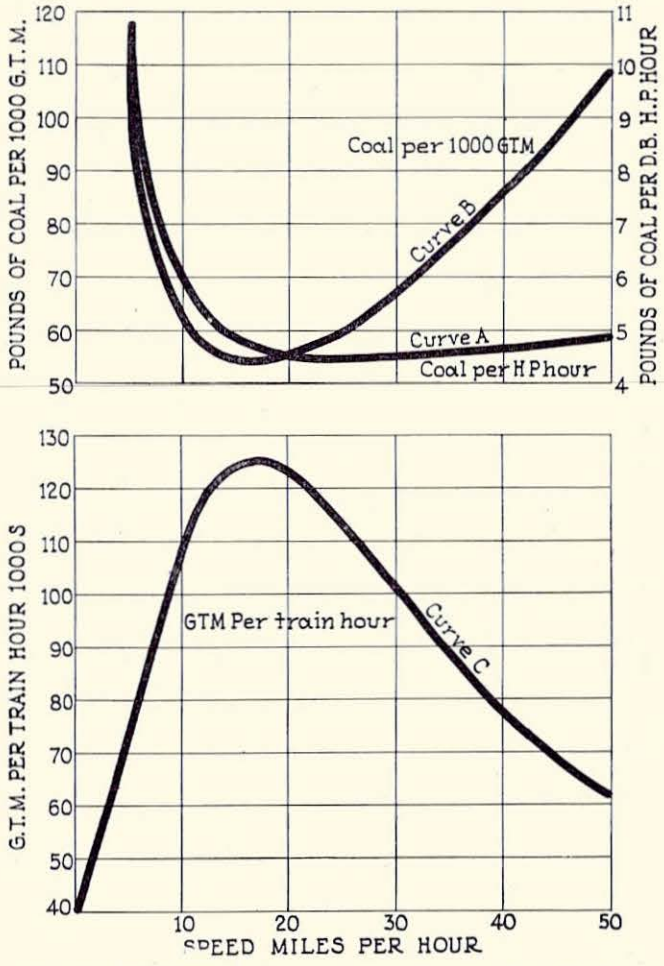



Fig. 4. With Mikado Locomotive on One Per Cent Grade

## Statement Showing the Effect of Speed and Loading on Fuel and Wage Costs Armagh Subdivision, Canadian National

| Speed on Grade | Drawbar pull, Pounds | Car Resistance per ton, Pounds | Maximum load, Tons | Length of Run | Total Time required, Hours | 1000 G.T.M. developed | Fuel per 1000 G.T.M., Pounds | Cost per Gross Ton Handled: Fuel, Cents | Wages, Cents | Total, Cents | Per cent of Increase over economic speed |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 47000 | 11.72 | 4060 | 101 miles | 17.45 | 410.06 | 253.75 | 5.89 | 2.47 | 8.36 | 90.43 |
| 7 | 45400 | 11.81 | 3842 | | 13.10 | 388.04 | 199.88 | 4.64 | 1.82 | 6.46 | 47.15 |
| 10 | 41400 | 11.96 | 3470 | | 9.85 | 350.47 | 158.43 | 3.68 | 1.27 | 4.95 | 12.75 |
| 12 | 38300 | 12.04 | 3180 | | 8.58 | 321.18 | 146.07 | 3.39 | 1.11 | 4.50 | 2.50 |
| 15 | 35400 | 12.24 | 2730 | | 7.32 | 275.73 | 139.17 | 3.23 | 1.16 | 4.39 | 0.00 |
| 17 | 30600 | 12.38 | 2471 | | 6.72 | 249.57 | 137.45 | 3.19 | 1.28 | 4.47 | 1.82 |
| 18 | 29100 | 12.45 | 2335 | | 6.47 | 235.83 | 138.28 | 3.21 | 1.36 | 4.57 | 4.10 |
| 20 | 26500 | 12.60 | 2100 | | 6.05 | 212.10 | 140.33 | 3.26 | 1.55 | 4.81 | 9.56 |
| 22 | 24200 | 12.78 | 1880 | | 5.70 | 189.88 | 144.25 | 3.35 | 1.78 | 5.13 | 16.85 |
| 25 | 21050 | 13.03 | 1615 | | 5.29 | 163.11 | 150.88 | 3.50 | 2.18 | 5.68 | 29.38 |
| 30 | 16900 | 13.53 | 1248 | | 4.78 | 126.05 | 167.82 | 3.90 | 2.84 | 6.74 | 53.53 |
| 35 | 13650 | 14.10 | 967 | | 4.42 | 97.67 | 191.58 | 4.45 | 3.66 | 8.11 | 84.73 |
| 40 | 11350 | 14.78 | 767 | | 4.15 | 77.47 | 217.92 | 5.06 | 4.61 | 9.67 | 120.27 |
| 45 | 9900 | 15.35 | 636 | | 3.94 | 64.23 | 240.64 | 5.59 | 5.56 | 11.15 | 153.98 |
| 50 | 8700 | 16.47 | 528 | | 3.77 | 53.33 | 268.24 | 6.23 | 6.71 | 12.94 | 194.76 |

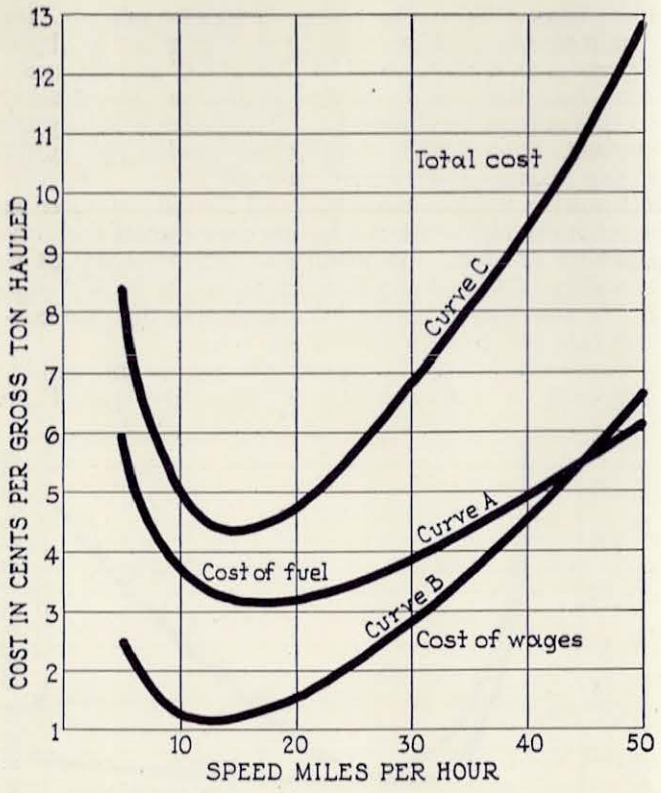



Fig. 5. Cost of Fuel and Wages per Gross Ton Hauled on the Armagh Subdivision

Hour," that can be produced, and it is interesting to note that the peak is reached at about 17 miles an hour. This also represents the speed at which the maximum utilization of power and equipment is obtained; that is, on a uniform grade, between given terminal in a given time, the greatest volume of tonnage can be moved when an engine is properly loaded for a speed of about 17 miles an hour.

Summarizing the results of this study we find that:

1. The maximum horsepower is developed at about 22 miles an hour.
2. The minimum in "Pounds of coal per horsepower-hour" is reached at 22 miles an hour.
3. The minimum in "Pounds of coal per 1,000 g.t.m." is reached at about 17 miles an hour.
4. The maximum in "Gross ton-miles per train hour" is developed at a speed of about 17 miles an hour.

### Grade Immaterial

To prove that these same laws hold true regardless of the rate of grade, Figs. 3 and 4 have been prepared in a similar manner for a one per cent gradient. Since the effect of gravity is simply to increase the rolling resistance and decrease the drawbar pull proportionately, there is little change in the characteristics of the curves, and the economic speeds remain almost the same.

The number of variables entering into the problem make it difficult of exact solution, but we have seen that there is an economic speed for train loading, either above or below, which spells wastefulness in the "coal pile," and that, on a long, continuous pull, a tonnage rating based on a speed of about 17 miles an hour will produce the most economical results in fuel consumption, and also in operating efficiency.

The accompanying statement has been prepared applying these laws to eastbound loadings on our Armagh subdivision where there is an almost continuous 0.4 per cent grade for 76 miles, the remaining 25 miles being mostly on descending track. It is interesting to observe that, from the standpoint of fuel consumption, the most economical loading speed remains at 17 miles an hour. From the standpoint of wages, it is 12½ miles an hour, and, when combining these two elements of cost, the economic speed becomes about 15 miles an hour.

The effect of increased speed on fuel consumption and train costs is clearly illustrated by reference to Fig. 5. If the speed were increased to 30 miles an hour, the cost of these items would be increased by some 53 per cent, if to 40 miles per hour by about 120 per cent and so on.

Incidentally it might be mentioned that the tonnage ratings now in effect agree exactly with this method of determination and are based on a speed that must give the best possible results when the trains are fully loaded.

# Freight Car Loading

WASHINGTON, D. C.

REVENUE freight car loading in the week ended August 8 was only 734,780 cars, a reduction of over 22,000 as compared with the preceding week. As compared with the corresponding week of last year this was a decrease of 169,377 cars, and as compared with 1929 it was a decrease of 357,373 cars. The decreases as compared with the week before were principally in the loading of grain and grain products, coal and miscellaneous freight. The summary, as compiled by the Car Service Division of the American Railway Association, follows:

**Revenue Freight Car Loading**

Week Ended Saturday, August 8, 1931

| Districts | 1931 | 1930 | 1929 |
|---|---|---|---|
| Eastern | 165,504 | 199,001 | 245,149 |
| Allegheny | 139,582 | 181,811 | 225,257 |
| Pocahontas | 46,738 | 51,407 | 63,003 |
| Southern | 102,939 | 118,004 | 141,711 |
| Northwestern | 104,604 | 143,725 | 180,451 |
| Central Western | 111,514 | 138,823 | 155,790 |
| Southwestern | 63,899 | 71,386 | 80,792 |
| Total Western Districts | 280,017 | 353,934 | 417,033 |
| Total All Roads | 734,780 | 904,157 | 1,092,153 |
| Commodities | | | |
| Grain and Grain Products | 46,340 | 61,286 | 64,211 |
| Live Stock | 19,299 | 20,225 | 22,054 |
| Coal | 108,447 | 131,612 | 158,467 |
| Coke | 4,366 | 8,261 | 11,951 |
| Forest Products | 27,560 | 40,672 | 68,542 |
| Ore | 34,046 | 58,207 | 78,953 |
| Merchandise L.C.L. | 214,455 | 234,040 | 259,253 |
| Miscellaneous | 280,267 | 349,854 | 428,722 |
| August 8 | 734,780 | 904,157 | 1,092,153 |
| August 1 | 757,293 | 919,781 | 1,105,920 |
| July 25 | 741,752 | 919,301 | 1,102,553 |
| July 18 | 757,555 | 928,271 | 1,079,968 |
| July 11 | 763,581 | 915,985 | 1,066,414 |
| Cumulative totals, 32 weeks | 23,402,824 | 28,580,124 | 31,975,104 |

The freight car surplus for the week ended July 31 averaged 564,068 cars, a reduction of 4,526 cars as compared with the week before. The total included 288,414 box cars, 211,044 coal cars, 27,071 stock cars and 13,262 refrigerator cars.

### Car Loading in Canada

Revenue car loadings in Canada for the week ended August 8 totaled 44,871, a decrease of 1,122 from the previous week and a decrease of 16,439 from the same week of 1930.

| | Total Cars Loaded | Total Cars Rec'd from Connections |
|---|---|---|
| Total for Canada | | |
| Aug. 8, 1931 | 44,871 | 22,174 |
| Aug. 1, 1931 | 45,993 | 22,494 |
| July 25, 1931 | 46,802 | 22,042 |
| Aug. 9, 1930 | 61,310 | 28,984 |
| Cumulative Totals for Canada | | |
| Aug. 8, 1931 | 1,534,698 | 853,991 |
| Aug. 9, 1930 | 1,886,720 | 1,091,730 |
| Aug. 10, 1929 | 2,119,965 | 1,334,971 |

# Light-Weight in Car Construction

## Tables show the extent of present applications and reductions effected in weights of steam and electric railway equipment

**By A. H. Woollen**

Aluminum Company of America, New Kensington, Pa.

APPROXIMATELY two Panama canals could be built annually with what it costs to transport the tare weight of the freight and passenger cars now in operation in the United States. Small wonder, then, that weight reduction is an economic problem of the first magnitude. Not only that, other factors must be considered—with light weight equipment, faster schedules can be maintained and there will be less wear on the road bed. This insures reduced operating costs.

During the early part of the twentieth century, steel, because of its fire-proof qualities, began to replace wood as the outstanding material in car construction. Its greater strength furnished an opportunity for developing cars with larger capacities and provided increased security in case of accident. The transition from wood to steel progressed in a normal manner. With the loads becoming heavier each year and with the trains operating at higher speeds and under more severe service conditions, the cars were made increasingly stronger —and heavier.

In time, it was found that the weight of the cars was mounting to such an extent that it was beginning to affect the motive power, the operating costs and the maintenance of equipment, permanent way and structures. With a reduction in dead weight, less propulsion energy would be required, smaller power plants could be employed or the same power plant could be utilized and faster schedule speeds obtained. Again, a reduction in the non-productive weight of a car could be turned into payload without any change in motive power. Railroads, which had employed wooden suburban cars up until now, found that the locomotives they used with these cars did not possess sufficient power to haul the same number of passengers in steel suburban cars. As a result of such conditions as these, a change in metal car design was a necessity, and within the past few years, an attempt has been made to produce a lighter car without sacrificing the strength and safety developed during the all-steel car era.

Refinement of steel car design could not proceed much farther. If high-strength steel were employed in place of ordinary structural steel, some of the desired saving in weight could be obtained because of the smaller cross sections which would be possible with the stronger material. However, any material reduction in cross section is very apt to result in too flexible a structure and one which is susceptible to a more rapid weakening by rust and deterioration.

Because of such limiting factors in steel car construction, it was necessary for the transportation engineer to turn to the lighter metals in order to accomplish any material reduction in weight. During the World War, the practicability and durability of the strong aluminum alloys of the duralumin type were well demonstrated, and since then, these alloys, and more recently developed strong aluminum alloys, have been extensively used in aircraft construction. Aluminum alloys, with tensile properties comparable to those of structural steel but weighing only one-third as much, were, therefore, ready for the railroads at the time lighter materials were considered essential, although, at first, they were not available in the larger commercial sizes and shapes.

### Use of Aluminum in Passenger Cars

As a result, during the development stage of the aluminum car, composite cars of aluminum and steel were built. These are now in successful operation and undoubtedly a number of composite cars will be built. However, shapes and plates in the light, strong alloys of aluminum are now available in sufficient lengths and sizes to permit the entire metal structure of the car to be built of them.

Since the energy required to move an electrified suburban train varies almost directly with its weight, the aluminization of railroad rolling stock naturally began in heavy electric traction. The first application of the strong aluminum alloys in suburban cars took place in 1923 with the construction of 25 trailer cars for the Illinois Central System. The operation of these cars was so successful in proving that aluminum could stand the gaff of this type of service that 85 additional trailers and 130 motor cars were constructed in 1926, and 10 trailers and 10 motor cars in 1928.

The applications of aluminum were not complete in any of the 260 cars, the metal being used only for the doors, conduit, fittings and sheet in the car body with the exception of the outside side sheets. However, the use of aluminum was sufficient to reduce the dead weight of the motor car 10,150 lb. and of the trailer 7,750 lb. Had the aluminum applications been carried farther and had the metal been used wherever it was an engineering possibility, the weight of the motor car could have been reduced approximately 45,000 lb. and the trailer 30,000 lb.

In 1926, the Pennsylvania Railroad carried the aluminization of suburban cars even farther by building eight motor cars with all-aluminum car bodies. By the use of aluminum, 13,100 pounds of dead weight was eliminated. This represented a saving of 10.5 per cent.

Applications of aluminum in heavy electric traction and steam railroad cars are listed in Table I. While weight reduction has been the primary reason for the use of aluminum, the chemical properties of the metal have dictated its use for tank-car construction. At the present time, more than 50 tank cars with aluminum tanks and standard steel underframes and trucks are in service on American railroads. Although the first aluminum tank car was built to facilitate the movement of large shipments of acetic acid, its use is by no means limited to this chemical alone. Many food products

# Table I—Statistical Record of the Use of Aluminum in Railway Cars

| Operator | Builder | Type | Date built | No. | Motive power | Weight of superstructure and underframe, including accessories, lb. | | | Weight of trucks | Total weight of car, lb. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Steel or composite [1] | With aluminum | Saved | | Steel or composite [1] | With aluminum | Saved | Per cent |
| 1—Illinois Central | Pullman | Trailer | 1923 | 25 | Elec. MU | 65,700 | 61,000 | 4,700 | 26,500 | 92,200 | 87,500 | 4,700 | 5.1 |
| 2—Illinois Central | Pullman | Motor | 1926 | 130 | Elec. MU | 90,150 | 80,000 | 10,150 | 60,000 | 150,150 | 140,000 | 10,150 | 6.7 |
| 3—Illinois Central | Std. Steel Car | Trailer | 1926 | 85 | Elec. MU | 69,950 | 62,200 | 7,750 | 26,500 | 96,450 | 88,700 | 7,750 | 8.0 |
| 4—Illinois Central | Pullman | Trailer | 1928 | 10 | Elec. MU | 69,950 | 62,200 | 7,750 | 26,500 | 96,450 | 88,700 | 7,750 | 8.0 |
| 5—Illinois Central | Pullman | Motor | 1928 | 10 | Elec. MU | 90,150 | 80,000 | 10,150 | 60,000 | 150,150 | 140,000 | 10,150 | 6.7 |
| 6—Pennsylvania | Pennsylvania | Motor | 1926 | 8 | Elec. MU | 80,000 | 66,900 | 13,100 | 44,450 | 124,450 | 111,350 | 13,100 | 10.5 |
| 7—Northwestern Pacific | St. Louis Car | Trailer | 1929 | 5 | Elec. MU | ..... | ..... | ..... | ..... | 85,050 | 79,000 | 6,050 | 7.1 |
| 8—Northwestern Pacific | St. Louis Car | Motor | 1929 | 5 | Elec. MU | ..... | ..... | ..... | ..... | 116,650 | 110,000 | 6,650 | 5.7 |
| 9—Northwestern Pacific | St. Louis Car | Motor | 1930 | 5 | Elec. MU | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ... |
| 10—Northwestern Pacific | St. Louis Car | Trailer | 1930 | 5 | Elec. MU | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ... |
| 11—Delaware, Lackawanna & Western | Pullman | Motor | 1930 | 141 | Elec. MU | ..... | ..... | ..... | ..... | 150,414 | 147,200 | 3,214 | 2.1 |
| 12—Reading | Bethlehem | Motor | 1930 | 70 | Elec. MU | ..... | ..... | ..... | ..... | ..... | 133,000 | ..... | ... |
| 13—Indiana Service Corp. | A. C. & F. | Motor | 1931 | 14 | Elec. MU | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ... |
| 14—Indiana Service Corp. | Pullman | Motor | 1931 | 21 | Elec. MU | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ... |
| 15—Chicago & North Western | A. C. & F. | Pass. | 1927 | 20 | Steam | 79,000 | 72,000 | 7,000 | 27,600 | 106,600 | 99,600 | 7,000 | 6.6 |
| 16—Chicago & North Western | Pullman | Pass. | 1927 | 40 | Steam | 79,000 | 72,000 | 7,000 | 27,600 | 106,600 | 99,600 | 7,000 | 6.6 |
| 17—Chicago & North Western | Std. Steel Car | Pass. | 1927 | 40 | Steam | 79,000 | 72,000 | 7,000 | 27,600 | 106,600 | 99,600 | 7,000 | 6.6 |
| 18—Chicago & North Western | A. C. & F. | Comb. | 1927 | 20 | Steam | 79,000 | 71,000 | 7,000 | 27,600 | 106,300 | 99,300 | 7,000 | 6.6 |
| 19—Chicago & North Western | Std. Steel Car | Comb. | 1929 | 5 | Steam | 79,000 | 71,000 | 7,000 | 27,600 | 106,300 | 99,300 | 7,000 | 6.6 |
| 20—Chicago & North Western | Std. Steel Car | Pass. | 1929 | 20 | Steam | 79,000 | 72,000 | 7,000 | 27,600 | 106,600 | 99,600 | 7,000 | 6.6 |
| 21—Central of New Jersey | Pressed Steel | Pass. | 1930 | 25 | Steam | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ... |
| 22—Various chemical companies | Std. Steel Car | Tank | 1929 | 35 | Steam | 16,450 [3] | 8,050 [3] | 8,400 [3] | 25,650 | 42,100 | 33,700 | 8,400 | 20.0 |
| 23—Various chemical companies | A. C. & F. | Tank | 1929 | 6 | Steam | 16,450 [3] | 8,050 [3] | 8,400 [3] | 25,650 | 42,100 | 33,700 | 8,400 | 20.0 |

| | Number seated passengers | Weight per seated passenger, lb. | | | Overall length Ft.—In. | Weight per linear foot, lb. | | | Aluminum applications |
|---|---|---|---|---|---|---|---|---|---|
| | | Steel or composite [1] | With aluminum | Saved | | Steel or composite [1] | With aluminum | Saved | |
| 1 | 84 | 1,098 | 1,042 | 56 | 72— 7½ | 1,270 | 1,206 | 64 | |
| 2 | 84 | 1,788 | 1,667 | 121 | 72— 7½ | 2,069 | 1,929 | 140 | |
| 3 | 84 | 1,148 | 1,056 | 92 | 72— 7½ | 1,329 | 1,222 | 107 | All sheet in superstructure, except outside sheet, doors, conduit and fittings |
| 4 | 84 | 1,148 | 1,056 | 92 | 72— 7½ | 1,329 | 1,222 | 107 | |
| 5 | 84 | 1,788 | 1,667 | 121 | 72— 7½ | 2,069 | 1,929 | 140 | |
| 6 | 72 | 1,728 | 1,547 | 181 | 64— 5¾ | 1,929 | 1,726 | 203 | Entire superstructure, doors, conduit and fittings |
| 7 | 103 [2] | 826 | 767 | 59 | 72—10½ | 1,168 | 1,085 | 83 | Roof sheet, interior finish, seats, conduits and fittings |
| 8 | 98 [2] | 1,190 | 1,122 | 68 | 72—10½ | 1,602 | 1,510 | 92 | |
| 9 | ... | .... | .... | ... | ..... | .... | .... | ... | ..... |
| 10 | ... | .... | .... | ... | ..... | .... | .... | ... | ..... |
| 11 | 84 | 1,790 | 1,750 | 40 | 70— 3½ | 2,142 | 2,096 | 46 | Roof sheet and interior finish |
| 12 | 62 | .... | .... | ... | 63— 0 | .... | .... | ... | All superstructure except framework |
| 13 | ... | .... | .... | ... | ..... | .... | .... | ... | ..... |
| 14 | ... | .... | .... | ... | ..... | .... | .... | ... | ..... |
| 15 | 98 | 1,088 | 1,016 | 72 | 79— 3¼ | 1,345 | 1,257 | 88 | |
| 16 | 98 | 1,088 | 1,016 | 72 | 79— 3¼ | 1,345 | 1,257 | 88 | |
| 17 | 98 | 1,088 | 1,016 | 72 | 79— 3¼ | 1,345 | 1,257 | 88 | |
| 18 | 72 | .... | .... | ... | 79— 3¼ | 1,341 | 1,253 | 88 | All sheet in superstructure |
| 19 | 72 | .... | .... | ... | 79— 3¼ | 1,345 | 1,257 | 88 | |
| 20 | 98 | 1,088 | 1,016 | 72 | 79— 3¼ | 1,345 | 1,257 | 88 | |
| 21 | ... | .... | .... | ... | ..... | .... | .... | ... | ..... |
| 22 | 8,000 [4] | .... | .... | ... | 32— 5⅝ | 1,295 | 1,037 | 258 | Entire tank and fittings, including coils |
| 23 | 8,000 [4] | .... | .... | ... | 32— 5⅝ | 1,295 | 1,037 | 258 | |

[1]—In the majority of cases no similar equipment exists in steel or composite steel construction.
[2]—Because of the 3—2 seating arrangement, seating capacity per square foot is greater.
[3]—Weight of tank and tank fittings.
[4]—Capacity in gallons.

# Table II—Statistical Record of the Use of Aluminum on City Electric Railway Cars

| Operator | Builder | Type | Date built | No. | Weight of superstructure, including accessories, lb. | | | Weight of underframe, lb. | | | Weight of trucks, including motors, lb. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Steel or composite [1] | With aluminum | Saved | Steel or composite [1] | With aluminum | Saved | Steel or composite [1] | With aluminum | Saved |
| 1—Cleveland Ry | Cleveland Ry. | St. car | 1926 | 1 | 15,500 | 12,000 | 3,500 | 6,300 | 4,400 | 1,900 | 21,400 | 13,900 | 7,500 |
| 2—Springfield St. Ry. | Wason Mfg. Co. | St. car | 1926 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 3—Chicago & Joliet Elec. Ry. Co. | Cummings Car & Coach Co. | St. car | 1927 | 1 | 16,800 | 7,800 | 9,000 | 7,100 | 2,600 | 4,500 | 13,300 | None | ..... |
| 4—St. Louis Pub. Ser. Co. | St. Louis Pub. Ser. Co. | St. car | 1927 | 1 | 17,950 | 15,100 | 2,850 | 6,950 | 4,450 | 2,500 | 12,450 | None | ..... |
| 5—St. Louis Pub. Ser. Co. | St. Louis Pub. Ser. Co. | St. car | 1929 | 1 | 17,950 | 15,100 | 2,850 | 6,950 | 4,300 | 2,650 | 16,800 | None | ..... |
| 6—Montreal Tramways, Ltd. | Can. C. & F. | St. car | 1927 | 10 | 21,100 | 17,400 | 3,700 | Weight includ. in superstruc. | | | 16,000 | None | ..... |
| 7—Montreal Tramways, Ltd. | Can. C. & F. | St. car | 1927 | 40 | 21,100 | 19,900 | 1,200 | " | " | " | 16,000 | None | ..... |
| 8—Montreal Tramways, Ltd. | Can. C. & F. | St. car | 1928 | 30 | 21,100 | 19,900 | 1,200 | " | " | " | 16,000 | None | ..... |
| 9—Twin City Rapid Trans. Co. | Transit Sup. Co. | St. car | 1927 | 25 | 17,500 | 14,900 | 2,600 | " | " | " | 12,800 | None | ..... |
| 10—Utah Light & Trac. Co. | Cincinnati Car | Trol. car | 1928 | 25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 11—J. G. Brill Co. (Demon.) | J. G. Brill Co. | St. car | 1929 | 1 | 14,850 | 10,400 | 4,450 | Weight includ. in superstruc. | | | 13,600 | None | ..... |
| 12—J. G. Brill Co. (Demon.) | American Car | Trol. car | 1929 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | | Bus type chassis | |
| 13—Delaware Elec. Power Co. | J. G. Brill Co. | St. car | 1929 | 15 | 22,550 | 19,550 | 3,000 | Weight includ. in superstruc. | | | 15,700 | None | ..... |
| 14—Dept. St. Rys., Detroit | P. A. Thomas Car | St. car | 1929 | 130 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 15—Louisville Ry. | Cincinnati Car | St. car | 1929 | 1 | 23,450 | 20,950 | 2,500 | Weight includ. in superstruc. | | | 8,200 | None | ..... |
| 16—Pittsburgh Rys. | Osgood-Bradley | St. car | 1929 | 1 | 23,200 | 14,000 | 9,200 | " | " | " | 13,100 | 11,250 | 1,850 |
| 17—Third Ave. Ry., N. Y. C. | J. G. Brill Co. | St. car | 1929 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 18—United Trac. Co., Albany, N. Y. | Cincinnati Car | St. car | 1929 | 1 | 27,200 | 24,700 | 2,500 | Weight includ. in superstruc. | | | 7,700 | None | ..... |
| 19—Brooklyn & Queens Trans. Corp. | J. G. Brill Co. | St. car | 1930 | 100 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 20—Allegheny Valley St. Ry. | Cincinnati Car | St. car | 1930 | 12 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 21—United Rys. & Elec. Co., Baltimore | J. G. Brill Co. | St. car | 1930 | 50 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 22—Bd. Transportation, N. Y. C. | A. C. & F. | Motor-MU | 1930 | 300 | 52,800 | 48,200 | 4,600 | Weight includ. in superstruc. | | | 36,000 | None | ..... |

| | Total weight of car. lb. | | | | Number seated passengers | Weight per seated passenger, lb. | | | Overall length ft.—in. | Weight per linear foot, lb. | | | Aluminum applications |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Steel or composite steel construc. [1] | With aluminum applica. | Saved | Per cent | | Steel or composite [1] | With aluminum | Saved | | Steel or composite [1] | With aluminum | Saved | |
| 1 | 43,200 | 30,300 | 12,900 | 29.9 | 55 | 785 | 551 | 234 | 51—2 | 844 | 592 | 252 | Entire superstruc. and underframe, except wood applica. and side sills, trucks complete except wheels, axles and springs |
| 2 | 35,500 | 25,300 | 10,200 | 28.7 | 45 | 789 | 562 | 227 | 30—8 | 1,154 | 822 | 332 | Side members, letter board, belt rail and body bolsters |
| 3 | 37,200 | 23,700 | 13,500 | 36.3 | 50 | 744 | 474 | 270 | 41—2½ | 894 | 576 | 318 | Entire superstruc. and underframe, except wood applications |
| 4 | 37,350 | 32,000 | 5,350 | 14.3 | 59 | 633 | 543 | 90 | 50—8 | 737 | 632 | 105 | Entire superstruc. and underframe, except wood applications |
| 5 | 41,700 | 36,200 | 5,500 | 13.2 | 62 | 673 | 584 | 89 | 50—8 | 823 | 714 | 109 | Entire superstructure and underframe, except wood applications |
| 6 | 37,100 | 33,400 | 3,700 | 10.0 | 44 | 843 | 759 | 84 | 46—2 | 804 | 723 | 81 | Entire superstructure and underframe, except wood applications |
| 7 | 37,100 | 35,900 | 1,200 | 3.2 | 44 | 843 | 718 | 26 | 46—2 | 804 | 778 | 26 | All sheet in superstructure |
| 8 | 37,100 | 35,900 | 1,200 | 3.2 | 44 | 843 | 817 | 26 | 46—2 | 804 | 778 | 26 | All sheet in superstructure |
| 9 | 30,300 | 27,700 | 2,600 | 8.6 | 50 | 606 | 554 | 52 | 45—6 | 666 | 609 | 57 | All metal in superstruc.; superstruc. principally of wood |
| 10 | ..... | ..... | ..... | ... | .. | ... | ... | ... | ..... | ... | ... | ... | ..... |
| 11 | 28,450 | 24,000 | 4,450 | 15.6 | 42 | 677 | 571 | 106 | 33—4¼ | 854 | 720 | 134 | Entire superstruc. and underframe, except wood applications |
| 12 | 16,350 | 14,500 | 1,850 | 11.3 | 30 | 545 | 483 | 62 | 28—0 | 584 | 518 | 66 | Entire superstruc. except wood applications, seats, floor framing and floor reinforcements |
| 13 | 38,250 | 35,250 | 3,000 | 7.8 | 42 | 911 | 833 | 78 | 43—3 | 884 | 815 | 69 | Sheeting, seats and miscellaneous parts |
| 14 | ..... | 37,000 | ..... | ... | 52 | ... | ... | ... | 48—5 | ... | ... | ... | Interior finish and side sheets |
| 15 | 31,650 | 29,150 | 2,500 | 7.9 | 48 | 659 | 607 | 52 | 41—2½ | 769 | 708 | 61 | Entire superstruc. and underframe, except wood applications and body bolsters |
| 16 | 36,300 | 25,250 | 11,050 | 30.4 | 42 | 864 | 601 | 263 | 45—3 | 804 | 558 | 246 | Entire superstruc. and underframe, except wood applications; trucks complete, except wheels, axles and springs |
| 17 | ..... | ..... | ..... | ... | .. | ... | ... | ... | ..... | ... | ... | ... | Entire superstructure and parts on trucks |
| 18 | 34,900 | 32,400 | 2,500 | 7.2 | 42 | 831 | 771 | 60 | 42—8½ | 818 | 759 | 59 | Entire superstructure and underframe, except wood applications and body bolsters |
| 19 | ..... | 37,000 | ..... | ... | 54 | ... | ... | ... | 45—6 | ... | ... | ... | Interior finish |
| 20 | ..... | 32,100 | ..... | ... | 48 | ... | ... | ... | 47—3 | ... | ... | ... | Seats and interior finish |
| 21 | ..... | 39,000 | ..... | ... | 52 | ... | ... | ... | 46—0 | ... | ... | ... | Interior finish |
| 22 | 88,800 | 84,200 | 4,600 | 5.2 | 60 | 1,480 | 1,403 | 77 | 60—6 | 1,468 | 1,390 | 78 | Interior finish, heaters and door engines |

[1]—In the majority of cases no similar equipment exists in steel or composite steel construction. For this reason weights are estimated for steel or composite steel equipment.

and chemicals react with steel and must be shipped in small containers or in rubber, glass, tin or lead lined steel tank cars. Transparent lacquers, glycerine, formaldehyde, fuming nitric acid, sulphuric acid, milk and turpentine are but a few of the products which can be shipped in aluminum tank cars without becoming discolored or contaminated. Of course, wherever aluminum is used weight reduction enters into the picture and the aluminum tanks cars weigh between four and five tons less than similar cars built from the heavier materials.

Closely paralleling the weight reduction campaign of the railroads is that of the electric street railways. As early as 1921, it became evident that radical changes would have to be made in street car design and construction in order to cope with the ever increasing automotive competition. The bus and the privately owned automobile were offering the riding public faster schedules and more comfortable equipment. They were making serious inroads into the business of the street car companies throughout the country.

### Applications on Street Cars

But to handle mass transportation economically, the street car and its companions, the subway car and the elevated car, are essential. Therefore, to rescue it from financial doldrums and preserve this service for the even more congested traffic of the future, the street railway companies were compelled to provide greater comfort for the passengers, to increase schedule speeds and to decrease operating costs. In order to pep up the operating schedules, quicker acceleration and deceleration are imperative; to accomplish these speed characteristics effectively and to decrease the cost of operation, light weight construction is a necessity.

The Cleveland Railway, the Chicago and Joliet Railway and the Springfield Street Railway were among the first to appreciate the light weight of aluminum for car construction. These operators did not allow their engineering judgment to be hampered by the conventions of electric railway car construction. When the decision was reached to use aluminum, they had but one purpose in mind, the elimination of dead weight, and instead of replacing steel with aluminum piece-meal, practically the entire cars were aluminized. The metal was used in both the car body and equipment, and in the case of the Cleveland car, in the trucks as well. The weight of each of the three cars was decreased approximately 30 per cent.

The efforts of these street car companies were far reaching. Their experiments were so complete that today there are but few innovations in the use of aluminum. Since the all-aluminum car of the Cleveland Railway was built in 1926, 448 street cars and 300 rapid transit cars with aluminum applications have been constructed. Table II lists these cars in chronological order and gives the weight saving in each case.

### The Cost of Weight Reduction

The initial cost of aluminum for street cars or railroad coaches is, of course, greater than that of the other materials commonly used in car construction. At the present time, the aluminum alloys cost from 27 to 45 cents per pound as compared with steel at 3 to 6 cents per pound. But steel is three times as heavy as aluminum. Therefore, for equal volumes, the cost of steel would be 9 to 18 cents. Nevertheless, the additional cost of aluminum will amount to from $800 in a small city street car to $4,000 to $5,000 in a large heavy electric traction or railroad car. Experience has indicated that the additional cost of aluminum can be reduced to a unit figure of 15 to 20 cents per pound of weight saved.

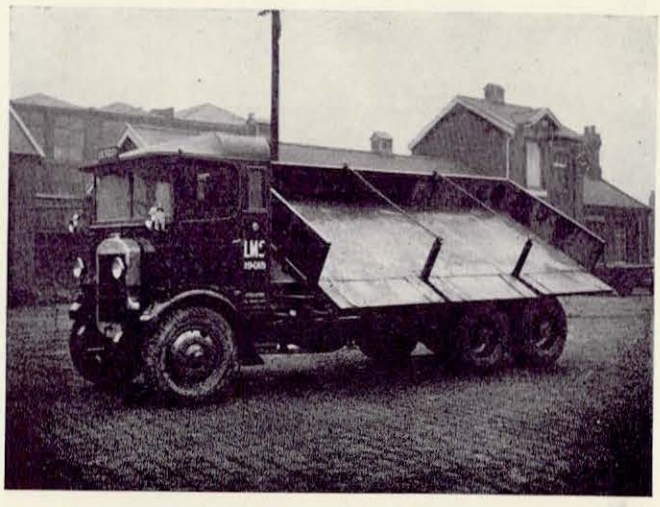
The higher initial cost of aluminum may be justified by a direct saving in propulsion energy. It has been estimated by various operating authorities that the cost of power varies between 5 and 10 cents per pound per year on street railways to 3.5 cents per pound per year on heavy electric traction lines. Assuming 5 cents per pound as the average yearly power saving, it is obvious that within three or four years the additional cost of the aluminum application can be written off, and after that time, the operating company will gain a return on the investment. But this does not take into consideration any changes in power equipment.

If the traction company or railroad does not desire to capitalize on the increased schedule speeds the lightweight aluminum car affords, smaller, lighter and less expensive motors can be installed. The monetary saving in power equipment may often balance the additional initial cost of aluminum, and in such cases, the saving in propulsion energy is a net earning to the operating company from the outset. There is, of course, the alternative of taking advantage of weight reduction by a partial saving in the cost of motor equipment and a partial improvement in operating schedules.

As a result of the higher scrap value of aluminum, an additional return will result when it comes to replacements or the car has reached the end of its period of usefulness. The residual value of the aluminum is between 60 and 65 per cent of its going ingot value whereas the scrap value of steel is practically a negligible item.

The experience which has been gained by the use of aluminum in steam and electric railway cars clearly shows that aluminum has arrived as a material for car construction. In the metal's early struggle for a place in commerce, its producers dreamed of cars built of the then new and novel light weight metal. But their dreams were only prophetic, and instead, the metal seemed destined to be used only in cooking utensils. More than forty years have passed; since then, strong aluminum alloys have been developed and heat treating processes perfected. Through the use of these alloys and processes, the radical prophecies of the early nineties have been fulfilled. Aluminum has not only justified the claims of its early producers but has proved its economic worth to the railroads.

* * *



Side Dump Motor Truck Operated by the London, Midland & Scottish of Great Britain

# Shippers Oppose Rate Increase

## Declare higher rates will cause diversion to trucks and barges

WASHINGTON, D. C.

IF predictions of shippers as to the volume of freight traffic that will be diverted from the railroads to trucks in the event of a 15 per cent increase in freight rates should come true a large part of the unemployed population of the United States could find jobs driving trucks. Testimony on behalf of shippers, mostly in opposition to the proposed rate advance, was continued last week before Commissioners Meyer and Eastman of the Interstate Commerce Commission, and this week before Commissioners Meyer and Porter, while hearings were also begun on August 17 before Commissioners Lewis and Lee at San Francisco and before Commissioner Eastman at Atlanta. The Washington hearing was expected to be concluded Thursday, a day sooner than had been announced. On Monday, after eight witnesses had been heard, it appeared that five others who had been scheduled had not appeared, and it was necessary to take an early adjournment on several days for lack of witnesses who were ready.

Some witnesses said they had no objection to an increase in freight rates if the commission found one necessary, although most of them expressed doubt as to whether the railroads would gain by it and some advocated a flat increase instead of a percentage. Most of the witnesses who opposed an increase in rates pointed to the depressed condition of their own industries and said that because of competition the increase could not be passed on to the consumer, and in nearly every case predicted that the result of a rail rate increase would be to divert a large volume of tonnage to trucks or water transportation, although many said that the shippers preferred to use rail transportation. Many witnesses, however, explained that they had been forced by lower prices to seek other forms of transportation already to a large extent and merely declared that this process would be accentuated by an increase in freight rates. There were no promises not to use trucks if there is no increase.

### Railroads Still Needed

There was practically no denial that the railroads need an increase in revenues but after the truck argument had to some extent supplanted the depression argument as the principal talking point of the shippers' witnesses Commissioner Meyer began to ask some of them how they expected the railroads to get more money and whether they believed they could conduct business satisfactorily without the railroads. The answer was that the railroads are still needed but that an increase in rates would not help their situation. Commissioner Meyer at one point said that in asking questions he was assuming that the country still needed its railroads.

H. M. Mabey, traffic manager of the Mathieson Alkali Works, appearing on behalf of the Manufacturing Chemists' Association, said that if any increase is allowed the commission should treat it as an emergency matter and set a definite expiration date, although he had no proposal to offer as to how the end of the emergency was to be dated. While not specifically opposing an increase in rates he said that a higher rate level might well cause further reductions in railroad tonnage of heavy chemicals because the manufacturers would have no other recourse but to seek cheaper forms of transportation, such as trucks and waterways. He declared that prices have been forced to so low a level in this industry that the manufacturers cannot expect to pass on an increase to their customers and that they are faced with the possibility of the users of chemicals manufacturing their own supply just as the railroads are faced with the possibility of the shippers' furnishing their own transportation. If they make investments in trucks for this purpose, he said, the traffic will be permanently lost to the railroads.

Mr. Mabey also made the point that the revision of eastern class rates to become effective on December 3 includes severe increases for the chemical industry and would produce a double increase. A horizontal increase, he said would tend to limit the markets and would tend to cause a relocation of plants, following a tendency that is already in evidence. Asked his opinion of the theory that truck rates will also be advanced if the the rail rates go up he said he thought the measure of the rail rates has very little to do with it. Truck rates often depend, he said, on whether the truck owner has had breakfast but he thought the more important question is the cost at which the manufacturer can perform his own transportation. It had been against the company's policy to use trucks extensively but in some instances for short hauls he had convinced himself that truck transportation would cost only half of the rail rate.

William Martin, of the Philadelphia Quartz Company, manufacturers of silicate of soda, said that his products sells for only three-fourths of a cent a pound and cannot stand high freight rates or move for long distances, as indicated by the fact that his company has three plants only 80 miles apart. He said any increase in rates would curtail the markets and he asked why the roads could not apply to freight their practice of making reduced excursion rates for passengers.

### Truck Shippers Help to Cripple Railroads

J. C. Davie, chairman of the traffic committee of the Illuminating Glassware League, Philadelphia, spent nearly half an hour in explaining that his industry has been in a depressed condition for several years and that increased freight rates would tend to curtail its markets but for the next half hour he said that if the commission finds that the railroads require additional revenue in order to maintain their "super service" and obtain a fair return the industry was willing to shoulder its share of the burden. He expressed the opinion that to say that trucks or water lines can be substituted for railroad service is "ridiculous". He said his industry had refrained from using trucks and he believed that shippers who have diverted their freight to trucks are helping to cripple their main transportation dependency. Mr. Davie said that foreign competition is encountered as far west as Wichita, Kan., because of the cheap barge transportation on the Mississippi river, and that when barge service is established on the Missouri river it will be increased.

Representatives of the stone, sand and gravel, tile and related industries based their objection mainly on the proposal to increase rates by the percentage method and said that if an increase is found necessary it should be made by specific cents per ton, although most of them testified that any increase would divert much of the tonnage to trucks. W. A. Hulshizer, of the Limestone Products Corporation of America, said a 15 per cent increase would seriously affect its business, amounting to 21 to 28 cents a ton which it would be compelled to absorb because of competition.

R. O. Youngerman, traffic manager of the Structural Clay Tile Association, suggested an increase of one cent per ton if the commission finds the railroads need an increase. When Commissioner Eastman asked if some plants would not receive the advantage lost by others by reason of a percentage advance he replied that it would increase the competition of the cement block industry. Frank H. Luther, appearing for the Standard Lime & Stone Company and the Washington Building Lime Company, said that if the commission allows an increase in rates it should require that it be made on a flat basis of cents per ton in the case of fluxing stone, ground limestone, dolomite and cement. He expressed the belief that an increase in rates would not mean more revenue for the roads but that if the commission finds there should be an increase it should be on a flat basis. J. F. Potts, representing the Kelly Island Lime & Transport Company, made a similar recommendation but said the carriers should be required to advise the commission in advance what commodities they would except from the percentage advance.

Benjamin J. Brooks, traffic manager of the National Granite Commission, said that the industry had voted to oppose a 15 per cent increase. Like the farmers, he said, they had been struggling for years to keep going and an increase in freight rates would add a further handicap, particularly since so many contracts are made months in advance and an increase during the life of a contract would eat up the profit. He also pointed out that the railroads are proposing many increases on granite in a separate case before the commission and said that if both increases are allowed it would make increases ranging from 22 to 86 per cent.

V. P. Ahearn, executive secretary of the National Sand & Gravel Association, presented an exhibit showing that whereas the railroads in 1921 handled 50.8 per cent of the country's production of sand, gravel and stone products, this had been reduced to 41.1 per cent in 1929 by reason of diversion to trucks and water lines. He said that reductions which have been made in many instances by the railroads in their rates have brought increases in traffic but that an increase now would have an opposite effect. The railroads had recognized that such commodities cannot stand high rates, he said, by suggesting that it may be necessary to treat short-haul traffic as a by-product. When Mr. Ahearn advocated a flat increase rather than a percentage increase Commissioner Eastman pointed out that this would increase short-haul rates more than 15 per cent. Mr. Ahearn said that the short-haul traffic would then use the trucks but he felt that the railroads would make more money by reducing the rates. A. W. Dann, of the Keystone Sand & Supply Company, Pittsburgh, said that if an increase is found necessary his company will do the best it can to get along under it but he was of the opinion that railroads are not more affected by the depression than other industries. However, he said he recognized that railroads are an important element in the general business situation.

G. W. Renwick, vice-president of the Chicago Gravel Company, testified that a 15 per cent increase would defeat its purpose by diverting business to the trucks. Commissioner Eastman, who had been trying unsuccessfully to obtain some actual truck cost figures from various witnesses, brought out that while one man is required to handle even 15 tons by truck a crew of four railroad employees will handle 800 tons in the average trainload shipped by this company. R. J. Windrow, of the Texas, Sand Gravel & Crushed Stone Association, said that if the rates are advanced the industry will have no alternative but to use trucks to a greater extent.

S. L. Willson, president of the American Paper & Pulp Association, said the association had made a canvass of the industry and had found it almost unanimously opposed to a rate increase. He estimated that it would increase the cost of finished paper by $2 a ton or a total of $20,000,000 a year and from this he calculated that the paper industry would be asked to contribute 5 per cent of the $400,000,000 asked by the railroads although it represents only 1.6 per cent of the country's totaled manufactured products. He said that the average price of paper commodities has been reduced 26.9 per cent since 1919 while the average railroad rate has increased 63 per cent.

Chester A. Fulton, of Baltimore, appearing on behalf of producers of Florida phosphate rock, said that the industry is in no position to stand increased rates because of the keen competition, particularly that of the government monopoly in Morocco, which is attempting to invade American markets, and that any increase in rates would mean that the railroads would be used only for the short haul from the mines to the nearest port for coastwise vessels, while much of the export trade would be lost. He gave some figures to show that this would mean a loss of revenue to the railroads. "Admitting that the railroads may need an increase in revenue," he said, "who does not?"

### Petroleum Companies Object

Various representatives of petroleum refining companies in Pennsylvania, Ohio and New Jersey objected to any increase in freight rates on the ground that their prices have been reduced more than those of almost any other commodity and that their only recourse, if rates should be advanced, would be to cheaper forms of transportation. Earl A. Barror, traffic manager of the Valvoline Oil Company, Butler, Pa., testified that oil rates have been increased in many instances in the general oil rate revision and also in the eastern class rate revision, and he expressed the view that the railroads would improve their own situation if they would make their rates to meet those of other forms of transportation. When he contended that the oil refiner pays the gasoline taxes by being compelled to shrink his prices, Mr. Bikle asked if we were to understand that the truck should receive no credit for this contribution toward the cost of road-building. The witness said he did not see how it could but Commissioner Meyer interposed that the question of the incidence of taxation is a matter for research elsewhere. A. W. Scott, secretary of the Wolverine-Empire Refining Company, said that rates for short hauls must be reduced rather than increased if the carriers hope to meet the competition of truck transportation and that if rates are increased the tendency necessarily will be toward a restriction of the marketing area for petroleum products by rail.

F. A. Ogden, general freight agent of the Jones & Laughlin Steel Corporation, objected to any increase in rates on iron ore or iron and steel products, saying that an increase would only hamper business and would do no good to the railroads or other forms of transpor-

tation. He expressed the opinion that the condition confronting the railroads is not a matter of freight rates but of lack of business and he asked if it would not be better to reduce rates, as has been done in other times of depression. Mr. Ogden particularly opposed an increase in rates on ore, saying it would be "a rank discrimination in favor of the United States Steel Corporation," and he sought to introduce an exhibit regarding the earning of the Duluth, Missabe & Northern, which he said earned 11.02 per cent on its book value last year, and the Bessemer & Lake Erie, which he said earned 10.59 per cent, because they are controlled by the Steel Corporation. On objection by railroad counsel these were not received, because of the ruling of the commission that it would not receive evidence as to individual roads, but Mr. Ogden was allowed to testify that he objected to paying higher rates to make dividends for the Steel Corporation.

J. V. McMahon, traffic manager of the Youngstown, Ohio, Chamber of Commerce, based his objection on the ground that an increase in railroad rates would make it more difficult for the Youngstown iron and steel district to compete with the districts located on the rivers and lakes accessible to water transportation, such as Pittsburgh, Buffalo, Detroit and Chicago. F. M. Renshaw, traffic commissioner of the Buffalo Chamber of Commerce, said the directors of that organization had gone on record as favoring the 15 per cent increase in freight rates provided it is not added to the increases in class rates included in the general revision of eastern class rates which the commission had ordered effective on December 3, but that they were opposed to both adjustments being made. He said that many shippers prefer to use the railroads but that if such a large increase is made as would result from the double increase they would have to resort to truck transportation.

W. G. Clayton, Jr., appearing for the Buffalo Bolt Company, said that company would prefer to ship by railroad but that many of its customers demand store-door delivery and small shipments at a time to keep inventories down and that about 25 per cent of its business to New York and 12 to 15 per cent of its business to Chicago goes by truck. With an increase in rates on top of the eastern class rate changes he thought that much of what is now carload business would be diverted to trucks. J. G. Barbour, secretary of the Metropolitan Paving Brick Company, objected to an increase in rates on the ground that it would add more to the cost of transporting paving brick than to that of other paving materials.

### Exception Asked For Fish

George E. Willey, president of the United States Fisheries Association, asked that products of fisheries be excepted from any general increase in rates on the ground that higher rates would seriously cripple the fisheries industry. This, he said, is in a deplorable state because the prices for seafood have sharply declined, and the association in another case is asking the establishment of commodity rates on fish to avoid the increases included in the eastern class rate revision. Charles G. Redlick, of the Jacob Dold Packing Company, said that an increase in freight rates would have a very serious effect on its business, which will also be affected by the eastern class rate revision, and would force it to seek a cheaper method of delivering its products.

E. A. Wiedemann, representing the Cast Stone Institute, said that an increase in the transportation cost of building materials at this time would not tend to promote the return of prosperity and would not help the carriers to obtain additional revenue. He asked that cast stone and crushed stone be exempted if any increase is allowed.

### 12 Railroads Lose Cement and Coal Tonnage

F. E. Paulson, traffic manager of the Lehigh Portland Cement Company, who also spoke for a number of other cement companies, asked the commission to deny the rate application on the ground that higher rates would not only divert a substantial portion of the traffic from the railroads to trucks and water transportation but that it would substantially lessen the length of haul of the traffic retained because business that can be handled by truck is rapidly supplanting that which must be moved for long distances. He said there is now the keenest kind of competition within a 50 or 60-mile radius and that the reduced prices have caused an increased use of trucks. He showed that whereas in 1921 85.57 per cent of the product of cement mills moved by railroad in 1930 this had been reduced to 75.53 per cent and he expressed the opinion that there had been a further reduction in 1931.

A. M. Stephen, traffic manager of the Standard Oil Company of Kentucky, said he had no doubt that the railroads need more money but he opposed a percentage advance in rates on the ground that it would disturb relationships and suggested instead a surcharge of $5 a car. He said his company had made arrangements for a greater use of barge lines on the Ohio and Mississippi rivers and that once tonnage leaves the railroads and investments are made to handle it otherwise there is an element of permanence.

F. M. Varah, manager of the traffic bureau of the Syracuse Chamber of Commerce, said his organization was not opposed to a 15 per cent increase if made on the present rates but it objected to the pyramiding involved in imposing it upon the increased class rates. Commissioner Meyer pointed out that if the Syracuse rates were to be advanced more than others in the class rate case it was because they had been too low before and he asked why it would be unfair to treat all rates alike if the rates are to be increased. Mr. Varah said that it perhaps was not unfair but that two increases at once would be hard to bear. He said there are now 52 motor truck services operating out of Syracuse to 580 points, the hauls ranging up to 350 miles, and that any increase in rates increases the number of trucks.

Milton E. Robinson, president of the National Retail Coal Association, expressed the opinion that an increase in rates would cause such a decrease in tonnage as to offset any increase in revenues. W. A. Clark, president of the New England Coal Dealers' Association, presented statistics showing that electricity, gas and oil have been steadily supplanting the use of coal since 1920 and that the use of trucks and water transportation for coal is being constantly increased. Frank J. Wallis, of the Pennsylvania Retail Coal Merchants' Association, estimated that 300,000 to 400,000 tons of anthracite is now being delivered by truck in Pennsylvania direct from the mines to points within a radius of 50 miles and said that the retail coal dealers are greatly concerned because the truckers are able to sell coal at $1 a ton cheaper than the established dealer. He gave the results of a survey which showed 153 tons a day trucked into Reading in September, 1930, 100 tons a day into Harrisburg and 208 tons a day into Lebanon and said that coal is being more and more used to furnish a return load for trucks. He said that the trucking of coal is now an unorganized business but he looked forward to its development into a highly organized business.

V. R. Tupper, representing manufacturers of steel office furniture, objected to the proposal to superimpose

a 15 per cent increase on the increased class rates and said that the use of trucks for this traffic is increasing. R. A. McLean, Jr., representing North Carolina fruit and vegetable growers, described the increasing use of trucks for the transportation of shipments as far as New York and said that a truck will pay for itself in three or four months but that the railroads are still needed for longer hauls.

### Fruits and Vegetables

A number of witnesses representing fruit and vegetable interests appeared on August 19, describing the depressed condition of their business due to lack of demand and low prices and asserting that higher freight rates would tend to restrict the traffic to what could move by truck. T. B. Young, of the Carolina Co-Operatives Consolidated, said that in his opinion this would mean going to a less favorable form of transportation and tend to bring about a worse economic condition but that it was necessary to resort to the cheapest form of transportation. G. Gale Harrison, of the Harrison Nurseries, Inc., which normally ship 500 carloads a year of fruits, fruit trees and nursery stock from the Berlin, Md., district, said that this year, because of low prices and lack of demand, they had not shipped a single carload by rail but were confining shipments to truck movements. He said that whereas the rail freight rate plus refrigeration is 59 cents to New York for second morning delivery trucks carry peaches for 25 cents overnight and avoid the necessity for refrigeration. Normally he would use the railroads for shipments to the middle West, New England or even Canada but this year it is necessary to choose between short hauls by truck and not picking peaches at all. Also many customers demand truck shipment of trees and nursery stock because of the saving in time. He said that a number of railroad officials had visited the district earlier in the year and made plans for giving first morning delivery at New York but the plans were not carried out because the cars are held at junctions to make up long trains. C. A. Roper, of the Mississippi Vegetable Shippers' Association, said there had been some truck shipments from his district but that most of the produce moves to points north of the Ohio. If freight rates are increased he thought there would be an increase in long-haul trucking. Walter A. Wilson, representing Virginia apple growers, said that an increasing proportion of the apples are moving by truck both to storage points and to markets, particularly as a truckload is a convenient unit for a small buyer and saves rehandling. One man having 20,000 bushels of apples in storage was said to have moved 3,000 with a single Ford truck himself, and to have shipped only one carload by rail in a year.

### Coal

The decline in the use of anthracite coal in recent years was cited by A. B. Jessup, president of the Anthracite Coal Operators' Association, as a reason for not increasing rates on this commodity, which he said is a household necessity on which sound public policy requires the lowest possible rates but he mentioned the competition of other fuels as the particular occasion for the decline. He said an increase in rates would cause a further decline in long-haul traffic in anthracite while the short-haul business would go to trucks. He said the average freight rate on anthracite is $3.44 a ton. E. C. Marianelli, attorney for the United Mine Workers, District No. 1, said the anthracite industry was in a depressed condition two years before the general business depression and that an increase in freight rates would seriously cripple it and cause further unemployment. He said that 52 collieries have been idle for four months or more, that would have employed 32,000 men and produced 14,000,000 tons.

Frank E. Carey, president of the F. E. Carey Coal Company, Chicago, and chairman of the bituminous trade relations committee of the National Retail Coal Merchants' Association, said that any increase in rates on coal will be reflected in increased prices to the consumer, with a consequent tendency to eliminate coal and substitute other fuels. He estimated that 60 per cent of the value of coal in the dealer's yard and 47 per cent of the consumer's coal bill represents freight charges. E. J. McVann, for the bituminous coal producers of Virginia, southern West Virginia, eastern Kentucky and Tennessee, said these operators oppose an increase in rates not in any spirit or hostility to the railroads but with the firm conviction that it would have disastrous effects and would not in the long run yield additional revenue to the roads. He said the rate level established by the commission in 1922 had remained practically the minimum as to coal from these districts, whereas the average value at the mine had been reduced from $3.75 in 1920 to $1.78 per ton and he estimated that three-fourths of the production is now being done at a loss. Mr. McVann made the point that the increased freight rate on approximately 3,000,000 tons of West Virginia coal would cost the New England railroads about $1,000,000 a year for their fuel and that in many cases railroads not having mines on their lines would have to pay 50 cents a ton more. He also said the railroads had delayed for 18 months in taking advantage of the increases in class rates allowed by the commission in the eastern and western class rate cases, and he presented a compilation showing that in the twelve months ended with June, 1931, the railroads had filed with the commission 7,432 applications for authority to publish tariffs on less than 30 days' notice, of which 6,760 had been granted, and he estimated that 80 per cent of the applications granted included reductions in rates.

C. L. Logsdon, representing manufacturers of floor and wall tile at Zanesville, Ohio, said that with a 15 per cent increase in freight rates, inland producing points would cease to exist because of the competition of plants located on water or nearer the markets, where they could use trucks.

Payne Williams, traffic counsel for the New York State Hay and Grain Dealers' Association, told of the reduced demand for hay because of the supplanting of the horse by trucks and of the serious competition of shipments by water to the New York city market. He said an increase in freight charges will add to the excessive burden now being carried by the farmer and tend to eliminate hay entirely as a revenue-producing product for both carrier and farmer.

There will be at least two concurrent hearings in Chicago in this case, beginning August 31, the commission has announced. Hearing A will be for cross-examination of witnesses presented at the Washington hearing by carriers and financial interests; evidence of state commissioners; evidence of agricultural, fruit-growing, livestock, poultry and dairy interests; evidence of canned goods, packinghouse products and strawboard interests; evidence of chambers of commerce and other commercial organizations, and rebuttal. Hearing B will be for evidence of various industries and commercial interests individually not requiring a large amount of time; evidence as to non-ferrous metals, lumber, coal, tile, sugar and other commodities; and rebuttal. Evidence relating to existing relations in rates or particular localities and rate groups will not be received.

# Railway Purchases in Six Months of 1931

ALTHOUGH decreasing at a slower rate than in 1930, the direct expenditures made by the Class I railways of the United States for materials and supplies continued to show reductions throughout the first six months of 1931, with the result that the aggregate purchases of approximately $428,000,000 were approximately $170,000,000, or 28.4 per cent, less than the purchases during the first half of 1930, and approximately $252,000,000, or 37.1 per cent below the corresponding purchases in 1929, according to estimates made by the *Railway Age* from special reports received from the railroads. Purchases were approximately $598,000,000 and $680,000,000 for the first half of 1930 and 1929, respectively. The purchases for the month of June, 1931, amounting to approximately $64,000,000 were 24.4 per cent below those in June, 1930, and 41.5 per cent below those of the same month in 1929. Compared with June, 1931, the total railway purchases amounted to approximately $89,000,000 in January, $68,000,000 in February, $71,000,000 in March, $70,000,000 in April and $66,000,000 in May.

Aggregate purchases included approximately $137,000,000 for fuel, $35,000,000 for rail, and $256,000,000 for miscellaneous materials, including forest products and storehouse supplies. Fuel purchases were approximately $31,000,000, or 18.4 per cent below the fuel purchases during the first half of 1930, and $47,000,000, or 25.4 per cent, below those for the first six months of 1929. Rail purchases were $5,000,000, or 12.5 per cent, below the corresponding purchases in 1930, and $19,000,000, or 35 per cent, below the 1929 purchases. The purchases of miscellaneous supplies were approximately $134,000,000, or 34.4 per cent, below first-half purchases in 1930, and $186,000,000, or 42.1 per cent, below first-half purchases in 1929.

Based on reports of 12 representative roads, the value of unapplied materials and supplies showed little change from the inventories at the close of 1930. At the close of June, 1931, these roads had stocks on hand valued at $92,675,000, compared with $93,436,000 at the close of 1930, a reduction of $761,000, or 0.8 per cent. Fuel on hand declined from $5,020,000 to $4,630,000, a reduction of 7.8 per cent. Rail stocks on these roads dropped from $6,865,000 to $6,157,000, a reduction of 10.3 per cent. Tie stocks decreased from $21,856,000 to $20,499,000, a reduction of 6.2 per cent, while other materials increased from $59,694,000 to $61,388,000, a slight increase of 2.8 per cent.

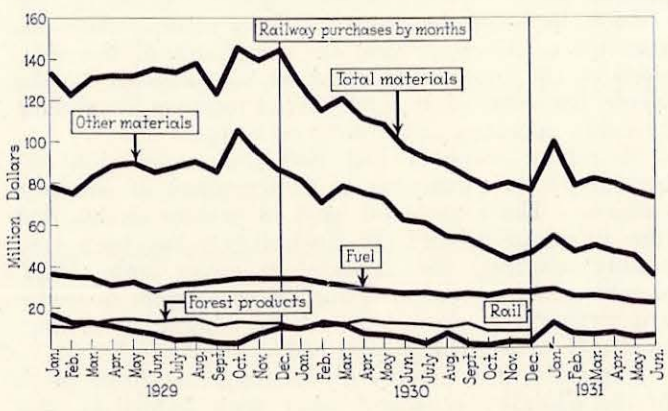



Chart Showing Trends of Railway Purchases by Months

# Rate Hearing in Oregon

CHARLES M. THOMAS, the public utilities commissioner of Oregon, entered a motion during the hearing before representatives of the Interstate Commerce Commission on the proposed 15 per cent increase in freight rates, which was held at Portland, Ore., on August 12 to 15, asking for a dismissal of the petition on the following grounds: (1) That the carriers have introduced no evidence under which the release sought can be granted; (2) that the petitioners have failed to show by competent evidence that the proposed rates will be reasonable, non-discriminatory and otherwise lawful; and (3) that the petitioners have failed to establish that any increase of freight rates and charges will produce an increase in revenue.

Mr. Thomas contended that the shippers could not stand the proposed increase, and that such an order would result in immense loss in tonnage and consequently in revenue to the carriers by reason of the diversion to waterways and truck lines. He also stated that such tonnage diverted to other means of transportation would not be restored if and when rates are returned to present levels. He also contended that it is extremely doubtful if the present volume of movement can long be maintained even under present rates, and that the present economic conditions demand a lower, not a higher level. Mr. Thomas also called attention to the fact that there are now two petitions before the railroad commission, one of which seeks a horizontal increase of 15 per cent on all commodities, while the second asks for a decrease of from 1 to 64 per cent on certain commodities which are included in the first proceeding.

Fred W. Baker, director of public works of the State of Washington, contended that an increase in rail rates would result in a still further diversion of freight traffic to truck lines. He stated that wool is now being hauled more than 175 miles by truck in Washington, and that wheat and other commodities are passing over the highways in increasing amounts.

A. F. Harvey, chief of transportation for the Oregon Public Utilities Commission, offered in evidence an exhibit showing a large increase in tax delinquencies as evidence of depressed agricultural conditions. He also pointed out that the rail carriers recently filed intrastate tariffs reducing rates on petroleum and petroleum products, including tank car lots, ranging up to 64 per cent, and insisted that an increase in commodity rates under such conditions would fall on the long haul shippers. He also stated that the roads serving the northwest were not "in danger of receivership" and submitted figures taken from the annual reports of the Southern Pacific, the Northern Pacific and the Great Northern to show that these railroads had a surplus. He insisted that a consolidation of service would be a better remedy for lack of revenue than increased rates.

J. M. Devers, attorney for the Oregon State Highway Commission, objected to the increased freight charges, since the annual amount paid by the commission in freight charges on supplies and materials used in highway construction within the state will be increased $70,000. He stated that with higher rates, more business would be diverted to the trucks and he felt that heavy hauling should remain on the rails. Charles H. Carter of the Portland Woolen Mills, testified for the members of the Oregon manufacturers and the woolen industry in particular, stating that the eight woolen mills and five knitting mills in the state vigorously opposed the rate increase.

O. M. Allison, secretary of the Spaulding Pulp & Paper Company at Newberg, protested, saying that his company had to depend entirely on rail transportation to reach its main markets, and that its freight bill, which last year amounted to $225,000, would be increased $33,570. He testified that his company is now developing the first of its water shipments, loading on barges at Newberg, shipping down the Willamette river to Portland, loading on the Luckenbach line to New Orleans, and then transhipping up the Mississippi into Hamilton, Ohio. Lawrence Calvert of the San Juan Fishing Company at Seattle, testified that 50 per cent of the fresh and frozen fish sent out of Seattle to Oregon and California destinations and as far east as Denver, are sent by truck.

Economies in railroad operation, rather than increased freight rates, is the railroads' avenue to adequate compensation for their services, according to A. S. Goss, master of the Washington State Grange. He also declared that he had noted considerable duplication of effort and expense on the part of the railroads that could be done away with in the public interest. He did not believe that the expenditures of large amounts by the railways for added service and equipment as a result of increased rates would bring relief through adding to urban prosperity and employment.

# Rate Hearing at Atlanta

THE southeastern regional hearing on the proposed 15 per cent increase in freight rates opened in Atlanta on August 17, before Commissioner Joseph B. Eastman, of the Interstate Commerce Commission. More than a score of southern freight bureaus, state corporation commissions, manufacturing and cotton cooperative associations, fruit growing organizations and individual shippers were represented by legal counsel and rate experts.

W. R. Cole, president of the Louisville & Nashville and official spokesman for the southern carriers, was cross-examined virtually the entire first day of the hearing, chiefly in regard to what economies the roads have put into effect. The witness said that his and other roads began no serious retrenchment until the latter part of 1930, but that now a large proportion of equipment is in bad order. A line of questioning, apparently designed to suggest that the carriers had willfully lost large sums of money in operating unnecessary passenger service, in order to bolster their plea for rate increases met with denial, and the witness would not commit himself as to the extent to which various state railroad commissions may have been responsible for the continuance of unprofitable passenger service, though pressed on this point by Hugh White, railroad commissioner of Alabama. In the face of a decline of almost 65 per cent in passenger traffic the last few years, there has not been a corresponding decrease in passenger service, he said. Drastic curtailment in through services to Florida was suggested by Mr. Cole as one means of financial retrenchment.

Examined as to the feasibility of pooling the revenues of all roads and apportionment of such so as to bring the financial status of the weaker roads up to the savings bank requirement of earnings equal to not less than one and one half times their fixed charges, President Cole characterized the proposal as "socialistic" and said he is backed in his views by Fairfax Harrison, president of the Southern. Only three of the southern carriers would be willing to agree to such a plan and their financial status is impaired, he added.

A strong protest to the proposed increase in rates was registered by the next witness, William C. Bewley, Macon, Ga., general manager of the Georgia Peach Growers Exchange. With a bumper crop, heavy expenses and prevailing low prices, the 1931 season was the most disastrous financial failure in the history of the state and increased rates would drive hundreds out of the industry, he said.

Although a director of the Central of Georgia, the next witness, W. D. Anderson, Macon, Ga., appeared in opposition to the increase. He is president of the Bibb Manufacturing Company of Macon and appeared as the representative of the American Cotton Manufacturers Association for Georgia, North and South Carolina. He was of the opinion that the carriers are "killing the goose that laid the golden egg" in seeking the increase and warned that the cotton growing and textile industries, now large users of highway trucks, would practically abandon all rail transportation in the face of increased costs. Concerning coal shipments, he pointed to the widespread southern net-work of natural gas, and fuel oil lines and hydro-electric power as substitutes for coal, which would be extended should the transportation costs of coal be raised.

Gordon McKelvey, attorney for the Tennessee Manufacturers Association testified that, "our members steadfastly maintain that it will be impossible for them to add this proposed increase in transportation costs to the cost price of their manufactures. Such an increase would at this time, unfairly discriminate against our industries and add a further burden to their business which would constitute a serious threat to their continued existence.

"Railroad transportation has constituted the very life blood of industry during the past four or five decades," he continued, "Naturally, then, we are sympathetic because of the predicament in which they now find themselves, brought about, as they say, by reason of decreased revenues. . . . . However, we honestly do not believe that the way out of their present dilemma is to increase the cost of their service at this time."

A resume of freight rate changes in southeastern territory both voluntary and by order of the Interstate Commerce Commission, for the last ten years, was given on August 18 by H. T. Moore, rate expert of the Atlanta Freight Bureau. This resume purported to show that the carriers had been dealt with leniently by the commission and that there had been more increases in rates, resulting in large increases in revenue, than there had been decreases during the ten-year period.

"Taking all the leading cases decided by the commission since 1920", said Mr. Moore, "I am of the opinion, based on the research I have made—which has been quite extensive—that the net result of the decisions of the Interstate Commerce Commission, on the whole, has resulted in a substantial increase in carriers' revenues operating in southern territory.

"Southern shippers feel that the commission has been more than generous in its treatment of southern carriers. The expression used in certain circles that 'the Interstate Commerce Commission has been constantly whittling the carriers' revenues since 1922', should cease, insofar as it applies to carriers in southern territory. I do not believe the charge to be true, or can it be truthfully sustained".

A picture of a steadily diminishing margin of profit in the Florida citrus and other fruit industries, that

*(Continued on page 299)*

# Motor Transport Section

## How Can Railways Recover Lost Freight Traffic?

**Four authorities give their conclusions as to effectiveness of pick-up and delivery service, reduced rates, over-night deliveries to distant points, and other measures**

MEETING and defeating motor truck competition and recovering freight traffic lost to highway competitors are essential to the future welfare of the railroads. Truck competition has seriously diminished the l.c.l. freight traffic of the railways and is making steadily deeper inroads into carload traffic. Depending as they do upon freight traffic for their livelihood, and with a large part of their investment in transportation facilities devoted more or less exclusively to the handling of freight of the sort which trucks are taking, the problem of meeting truck competition assumes a major degree of importance.

The railways are not giving up without a struggle. Experiments in improving their service have been made by a number of roads. Most of these experiments have involved the provision of store door pick-up and delivery service, faster freight service providing over-night movement of freight between points situated at a considerable distance from each other, and reductions in rates.

How effective have these measures been in winning traffic back from the motor trucks? Does the answer to the problem of motor truck competition lie along these or other lines? These questions were submitted by the *Railway Age* to several railway officers in direct charge of railway operations carried on for the purpose of meeting truck competition, and who were known to have been successful in their endeavors. It is believed that their personal opinions and conclusions, based as they are upon successful experience in meeting truck competition, will be of interest.

The specific questions submitted to these railway officers and their replies to them are given below substantially in full.

### Store Door Pick-up and Delivery Service

*(1) How effective is store door pick-up and delivery service, given at extra cost, in recovering lost traffic? How effective is it if it is given at no cost beyond the ordinary railroad freight rates?*

The Missouri-Kansas-Texas of Texas utilizes a subsidiary transportation company as a means of recovering freight traffic. The transportation company provides a service which involves pick-up and delivery by motor truck at originating and destination points and rail-haul between them. Replying to this first question, Harvey Allen, general freight agent of the railroad, says, "Our transportation company service is given without extra cost to shipper or receiver; therefore, we do not know from actual experience how effective store door pick-up and delivery service given at extra cost would be. It is only natural to assume that the shipping public would not take to such service when truck lines and forwarding companies give pick-up and delivery service without extra charge. Service given at no cost beyond ordinary railroad freight rates is afforded by the transportation company and places us on a basis comparable with class A trucks. It has been the means of regaining a considerable amount of merchandise, as evidenced by the monthly figures showing tonnage handled."

F. R. Forbes, manager of the Northwest Freight Transport Company, a subsidiary of the Spokane, Portland & Seattle, says, "Our experience has been with only one method of operation to meet highway truck competition. We have met truck rates with the pick-up and delivery feature and feel that we have been fairly successful in securing the return of some of the merchandise tonnage lost to those competitors in the last few years. Fortunately, we are able to serve our present territory with over-night service. In that respect, also, we are on a parity with the trucks. The Chicago lines are now experimenting, I understand, with the first method, and local conditions may prove this to be feasible. As to the second proposal, it would seem that pick-up and delivery service given at no cost beyond the ordinary railroad freight rates would be successful if the railroad rates at least approximated the rates of the highway carriers. Our class rates approximate rail rates, and in some instances are even somewhat higher, but are always on the same level as those of the truck lines. Any-quantity and low-minimum commodity rates, the same as truck lines carry, are considerably less than the rail class rates governing. In this connection, while the consolidated classification is prescribed by the Public Utilities Commission of Oregon for both rail and highway carriers, the highway carriers have departed from rigid classification by broad any-quantity commodity rate groupings, covering groceries, building materials and hardware, etc."

With regard to the effectiveness of pick-up and de-

livery service given at extra cost, T. E. Huffman, general freight agent of the Texas & Pacific Motor Transport Company says, "This was tried out by the motor transport company during September, October, and November, 1929, when our service was first inaugurated on the Texas & Pacific. The transport company's rates were 14.1 cents higher than rail rates on first class, 17 cents higher on second class, 22 cents higher on third class, and 28 cents higher on fourth class, or an average of 19½ cents higher than the regular station-to-station rates. Notwithstanding the fact that considerable advertising was carried in the newspapers, that leaflets advertising the service were mailed to shippers and receivers, and that personal solicitation was actively carried on, the tonnage handled by the transport company was very disappointing. The highway truck lines were charging the regular railway station-to-station rates (with no extra charge for pick-up and delivery service) but it was thought that due to the dependability and responsibility of the transport company, shippers would prefer to pay the higher rates in order to patronize a more reliable transportation company. This was not a fact. On December 9, 1929, the rates of the motor transport company (which gave store door service) were reduced to the level of the regular railroad station-to-station rates, which were the same as those charged by the class A truck lines. From December 9 to December 30, inclusive, there was an increase in our traffic of 1,236 per cent in comparison with that handled in the previous month. These rates were continued during January, 1930, and there was an increase in traffic of 2,803 per cent in January, 1930, as compared to December, 1929. This shows beyond a question that where the rates and service are equal, the shipping public prefers to do business with a transportation company which is entirely responsible."

L. B. Young, vice-president and manager of the Pacific Motor Transport Company, a subsidiary of the Southern Pacific, prefaces his statement with the comment that the opinions he offers are based entirely upon conditions which prevail on the Pacific coast, and they may or may not be applicable elsewhere. With reference to the two parts of the question given above, Mr. Young says, "The only logical answer to these two questions is that the rail rates are not the proper measure, and have nothing whatever to do with the matter. The only rates under which traffic can be recovered are rates, including pick-up and delivery, which are no higher than the rates charged by the trucks. If the rail rates, or the rail rates plus something extra, should by coincidence happen to be no higher than truck rates, then the adding of store door service might recover some traffic. However, it appears that the recovery would be only temporary, for the reason that if a railroad definitely limits its flexibility by declaring, as its policy, the maintaining of rail rates or something higher than rail rates, the trucks will promptly cut under them. The only way they can be dissuaded from constantly attempting to maintain rate levels lower than those of the railroads, is by demonstrating to them that any rate they make will promptly be met, regardless of the rail rate already in effect. There are also other factors to consider. Railroad rates, of course, include railroad rules, and even though the rail rate may be no higher than the truck rate, the trucks still have an advantage, too serious to be ignored, in their liberal classification of freight, lenient packing rules, and late closing of stations. The Pacific Motor Transport Company has had some measure of success in recovering traffic from trucks. Some of its rates are the same as rail rates; some are higher, and some are lower. All of them, together with accompanying rules and classification, were made to meet truck competition, and with absolute disregard for what the rail rates might be. The direct answer to the two questions is: It does not appear that pick-up and delivery service under railroad tariffs at rail rates or at something higher than rail rates would, *per se*, be quite effective in recovering freight traffic from highway competitors."

### Reduced Rates

*(2) How effective are reduced rates—rates reduced to the level of competitive lines—in recovering lost traffic, assuming that only the ordinary station-to-station service is provided?*

In replying to this question, Mr. Allen says, "My opinion is that such reductions are of no avail. Even though the rates are reduced to the level of competitive lines, when only station-to-station service is provided, they are in reality not on a level with those of the competitors, inasmuch as the truck lines furnish free store door to store door service, which is a convenience the shipping public desires."

Mr. Forbes says, "If truck lines are able to give service equal to rail service in any territory, with equal rates, the pick-up and delivery feature of their service will attract business in competition with equal rail service and station-to-station rates."

Mr. Huffman says, "The regulated class A truck lines in Texas are required to charge, and do charge, the same as the railway station-to-station rates, and the transport company furnished over-night service from the principle distributing points, having the shipments reach their destination for early next-morning delivery. Personal solicitation was made to principal receivers and shippers. We did not gain any tonnage by furnishing this over-night service. Shippers and receivers invariably stated that it would be necessary for us to furnish store door pick-up and delivery service also, at which time they would favor the motor transport company with their business."

Mr. Young says, "It does not appear that such rates would be effective in recovering traffic from the highways, for several reasons. The added cost of drayage is one of them; liberal classification and rules are another. Even on carload business, when both shipper and consignee have spur tracks and thus receive free delivery, the truck operators have the advantage in that they not only make pick-up and delivery, but the driver helps load and unload the cargo. It is not intended to imply that this is so as to all traffic. In fact, a very great deal of traffic will move by preference in railroad cars; but in that case, it has not been lost to the highways and this answer pertains only to that which has been lost."

### Over-night Service Between Distant Points

*(3) How effective in recovering traffic is faster freight service, accomplishing over-night movement between points as distant as 250 or 300 miles, assuming there is no reduction in the regular railway rates, and that pick-up and delivery service is not provided?*

In reply Mr. Allen says, "The answer to the second question also applies to this one. Our truck competitors accomplish over-night movement between points as distant as 250 miles and deliveries in the late morning or noon of the following day to points 300 miles distant, in addition to pick-up and delivery service. With similar service we can regain some of the lost tonnage and hold what we have, but it is necessary that we supplement the over-night movement with free pick-up and delivery service in order to make it attractive."

Mr. Forbes says, "In this territory the truck lines

are making over-night delivery between points as distant as 400 miles; for example, between Portland, Ore., and Spokane, Wash. A 4 p.m. departure from Portland allows delivery at Spokane about 10 the next morning. Over-night delivery is made from Portland, Ore., to Bend, 236 miles, leaving Portland at 6 p.m. with delivery at Bend by 8:30 or 9 a.m. the next morning. With service at least equal to that of the rail lines and with lower rates, the truck lines have an advantage that only can be met with equal service and rates, including the pick-up and delivery feature."

Mr. Huffman says, "Several months prior to the establishment of the pick-up and delivery service in September, 1929, the Texas & Pacific operated from the principal distributing points to points on our line as distant as 300 miles, a regular over-night service, the merchandise departing from the point of origin at 6:45 p.m. and being ready for delivery at all intermediate points up to 300 miles early the next morning. This service was advertised extensively through the newspapers, and by personal solicitation, and I am frank to say that I do not believe we gained one pound of freight, since the trucks were furnishing next-day delivery service over equal distances with store door pick-up and delivery at the regular station-to-station rates."

Mr. Young says, "It does not appear that over-night service by a railroad would be at all effective in recovering traffic from the highways unless the over-night service were accompanied by store door service and rates competitive with truck rates. Up to 300 miles, highway trucks can give over-night service without trouble. In fact, trucks can receive shipments at the point of origin up to a considerably later hour at night than a railroad can, and still give the over-night service. Thus, if railroad freight trains are speeded up to give over-night service, at best the railroad is merely equaling the trucks' time between terminals, which is only one of several equally controlling factors. With equal time between terminals, the trucks may still have these major advantages: Lower rates, free pick-up and delivery, more liberal classification and rules, lower minimum weights on quantity shipments, and probable later closing time at the point of origin. Over-night service is one of the factors indispensable to successful competition with trucks, but over-night service alone, without the other factors, would hardly seem to meet the situation."

### What Methods Are Necessary?

*(4) Which of these expedients, or what additional ones, are necessary, in your opinion, if the railways are to meet the competition of highway freight transportation, and how is your opinion supported by the experience of your company?*

In reply, Mr. Allen says, "The co-ordinated motor truck and rail line service offered by our transportation company, on regular rail rates with free pick-up and delivery service, furnishes the proper medium for meeting the competition of highway freight transportation. At least, this is our experience in Texas where we have laws governing the operation of motor trucks. To substantiate this statement, I call attention to the fact that the transportation company began operation with 27 open stations (pick-up and delivery points), but because of the necessity of expanding the service it was necessary gradually to add to these until, at the end of the first year's operation, on July 1, 1931, we had a total of 72 stations where pick-up and delivery service was provided. During the first year's operations, from July, 1930, to June, 1931 inclusive, the transportation company billed out 39,211,113 lb. of freight, and according to the best checks we have been able to make, approximately 60 to 70 per cent of this business is traffic diverted from competitive highway transportation. At a number of stations where the transportation company operates, the combined tonnage of the transportation company and the railroad company exceeds the tonnage handled by the railroad during the corresponding period in the previous year, but a like condition does not prevail at other stations on the railroad."

Mr. Forbes says, "As a transportation agency soliciting business, it seemed to us necessary to provide the same or equal facilities, rates, and service as our competitors. We have more than they to offer in dependability of service, stability of rates, and financial responsibility, but the average shipper will not allow full credit for these advantages as against a lower rate scale, faster service, and pick-up and delivery. We have found it necessary to keep our freight house at Portland open until 6 p.m. to receive late freight, and to arrange hours of warehousemen at other stations so as to provide the earliest possible morning delivery. With every reasonable practice of our highway competitors met fully, we expect to secure and hold our fair proportion of the merchandise movement."

Mr. Huffman says, "The highway trucks in Texas are well regulated; that is, they are required to operate on schedules, publish rates, operate between given termini, and to maintain rates the same as railroad station-to-station rates. Our experience has been that where the railroad companies furnish equally prompt service from distributing points, with pick-up and delivery at the same rates as the highway trucks, the majority of shippers and receivers will favor the railroad transport companies over the highway trucking companies. While the transport company has been showing substantial increases in traffic, the reports of the competitive highway truck lines to the Texas Railroad Commission have been showing decreases in tonnage as well as revenue. There are two very essential factors in recovering tonnage from motor trucks. These are rates and service. I really believe that rates are more important than service; in other words, the shippers will take a chance on irresponsible truck lines where they know the service will not be the very best, if they can save a few cents per hundred pounds on the transportation charge. It is rather doubtful if the railroad companies can recover from highway trucks tonnage which is moving over a distance of 50 miles or less, since the trucks are more flexible. But for distances of over 50 miles, we have demonstrated beyond a question that, where rates and service are equal, the shipping public prefers to use railroad transportation."

Mr. Young says, "For a railroad successfully to meet highway truck competition, the following expedients appear to be desirable: (1) A co-ordinated rail-truck operation presents many intricate problems and wide departures from railroad practice. Thus, it appears that the most satisfactory way for a railroad to engage in the business is through a subsidiary company that will not be bound by the affairs of the parent railroad company, and whose conduct will not interfere with them. The people have been educated up to new conditions in transportation, and they expect services that are not properly a part of the major business of railroad operation. On the lines of the Southern Pacific in California and Oregon, and on the lines of the Pacific Electric, the McCloud River Railroad and the Santa Maria Valley Railroad in California, this service is provided by the Pacific Motor Transport Company. (2) The carrier should stand ready to make rates competitive with the rates charged by truck operators, regardless

*(Continued on page 298)*

Union Pacific Motor Coach Routes Extend from the Middle West to the Pacific Coast

# Union Pacific Bus Operations Widespread

## Supplement entire rail system with 10,000 miles of motor coach routes—Saving 2,276,956 train miles annually

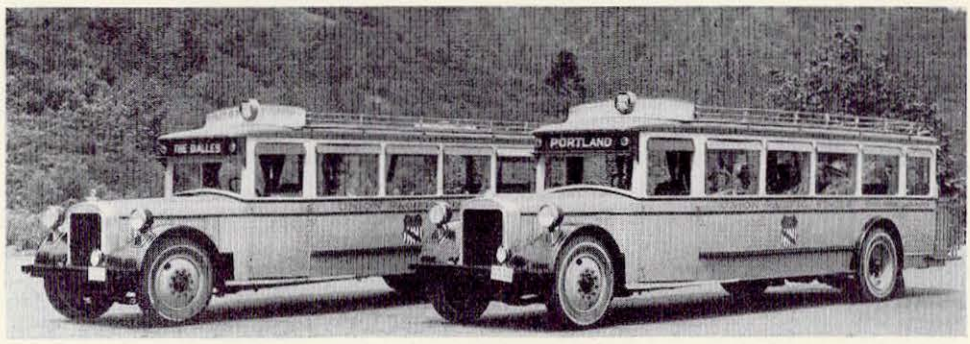
FEW railways have engaged so extensively in motor coach operation as the Union Pacific. With 10,140 miles of railway lines operated by the roads in the Union Pacific System, its various motor coach subsidiaries provide service over 10,216 miles of highway routes.

The Union Pacific had had some experience with motor coach operation, particularly in replacing or extending railway service, prior to 1929, but in that year the motor coach system saw its full development throughout Union Pacific territory. The reason was not obscure. Early in 1929, bus lines in all parts of Union Pacific territory were purchased and consolidated by a single large company. Every mile of the Union Pacific main line was paralleled by this operation, from Omaha, Neb., west to Denver, Colo., Salt Lake City, Utah, and Los Angeles, Calif., and from Salt Lake City to Pocatello, Ida., Boise, Pendleton, Ore., Spokane, Wash., and Portland, Ore.; also from Kansas City, Mo., west through Kansas to Denver. With this new service paralleling its main line and operating between the same stations, the Union Pacific's position in the passenger transportation field in its own territory was menaced because of the ability of the new competitive motor coach system to establish varying rates, to change its rates at will and to provide frequent service. At the same time the Parker bill was pending in Congress, and this bill provided for the granting of certificates of public convenience and necessity, permitting interstate operation, to the existing bus lines. Had the bill passed, the Union Pacific would have had to secure the approval of the Interstate Commerce Commission before it could establish bus service in its own territory, and there was a possibility of failure to obtain such authority because the highways were already covered by the Union Pacific's competitor. Briefly, the position of the Union Pacific at that time was that it had a competitor on the public highways serving every city on its trunk line; this competitor had the ability to make rates at will and to provide service on a right-of-way furnished and maintained by the public; and in addition, the Union Pacific was threatened with a law which might prohibit it from engaging in this same service upon the highways. Incidentally, these highways, for hundreds of miles, are located upon Union Pacific right-of-way furnished free to the public.

### Economies Possible

Passenger train travel had been falling off steadily since 1920. The patronage of certain trains had decreased to the point where they were being operated at a loss. Consequently, there were economies which could be brought about by the substitution of motor buses for steam passenger trains, particularly on local runs.

To meet this double-edged situation, the Union Pacific decided in February, 1929, to commence an extensive motor bus operation. The purpose was not only to provide bus service in substitution for train service, but also to make the bus operation profitable in itself after the period of development had been passed. Certain strategic feeder lines in Union Pacific territory were then purchased, and certificates of public convenience and necessity were secured from the various state commissions, after which the through transcontinental service was established. In order to obtain eastern connections, it was necessary to extend the oper-




Part of the Union Pacific Stages Equipment Operated in Oregon

ation from Omaha to Chicago and from Kansas City to St. Louis, Mo. The Chicago & North Western joined the undertaking to provide the service east of the Missouri river.

### Through Service Started

The through service was established on various sections of the transcontinental line, beginning in September, 1929. On September 1, the Salt Lake City-Portland line was opened. The line between Chicago and Denver was started on October 10, that between Denver and Salt Lake City was established on October 20, that between Salt Lake City and Los Angeles on October 27, that between Kansas City and Denver on November 10, and that between St. Louis and Kansas City on November 30.

Since the inauguration of this through service, the Union Pacific has taken off passenger trains which previously accumulated 2,276,956 train miles per year. The cost of operating the bus lines during the development period has been somewhat more than it will be after the operation has become fully established. Up to the present time, the operating costs have been approximately 28 cents per bus mile over the entire operation. It will be seen that the yearly savings to the Union Pacific, through the substitution of bus service for more than 2,000,000 miles of passenger train service, are of considerable magnitude.

### Earlier Experiences

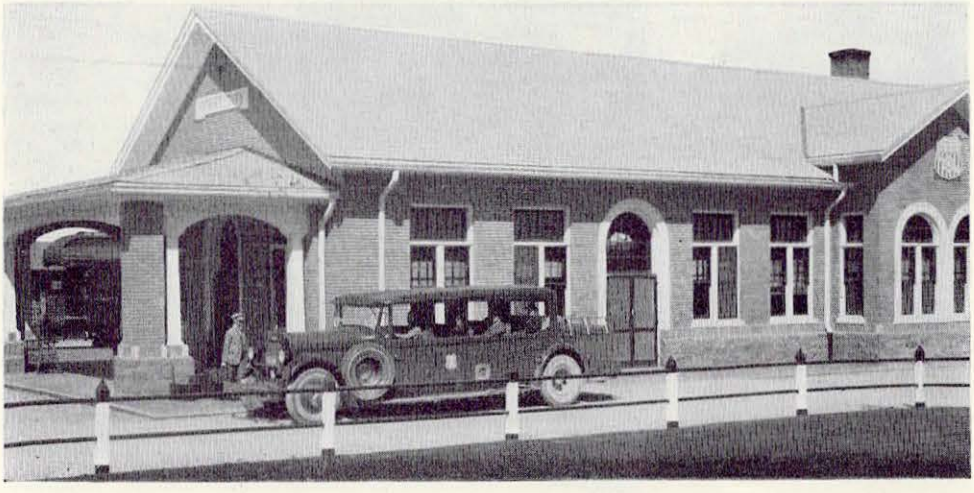
Motor bus substitution for train service was effected by the Union Pacific as early as August 20, 1925, so that in 1929, when it expanded its highway service, the railway knew what it could expect in the way of operating economies. In 1925, a motor bus service was substituted for a passenger train operated daily between Pendleton, Ore., and Walla Walla, Wash., a distance of 36 miles. The cost of operating the steam train was $19,680 per year. During the last four months of 1924, there was a net loss of $3,707.85 on the steam train operation. In the corresponding months of 1925, there was a net profit of $4,174.20 from the motor bus operation.

On July 1, 1927, this bus service was extended from Pendleton, Ore., to Portland, eliminating a passenger train between Pendleton and The Dalles, 132 miles. The saving in train operating expenses was $52,740 per year. In 1928, there was a net loss of $43,500 from the bus operations in the Oregon territory. This was more than offset, however, by the saving of $84,120 on account of the discontinuance of passenger trains.

The Union Pacific utilizes several motor coach operating companies to provide its service. Union Pacific Stages, Inc., which is owned by the Oregon Short Line, handles the bus operations between Salt Lake City, Portland, Spokane, and Butte, Mont. Interstate Transit Lines, which was previously a local operation in the Omaha territory and which was purchased by the Union Pacific, was extended to provide the service between Chicago and St. Louis on the east, and Los Angeles on the west, through Denver and Salt Lake City. The Chicago & North Western is a joint owner of Interstate Transit Lines with the Union Pacific. With 1,554 miles of intrastate routes and 1,703 miles of interstate routes, Union Pacific Stages operates 87 motor coaches. Interstate Transit Lines with 1,356 miles of intrastate routes and 4,874 miles of interstate routes, utilizes 188 motor coaches.

### Ticketing Arrangements

Union Pacific Stages carries passengers holding railroad tickets. The railroad company collects the amount paid for the transportation and pays to the stage company an amount representing in part the cost of handling the passengers. Bus tickets are not honored on railroad trains. Interstate Transit Lines does not



Utah Parks Company Buses Extend the Railway Service at Cedar City, Utah

generally handle rail tickets, although such an arrangement may be made soon. On certain branch lines, where bus service has been established in place of train service, Interstate Transit Lines has contracted with the railroad to provide bus service for handling passengers, mail, baggage, express, milk and cream, and newspapers at a contract price per bus mile, the railroad collecting and retaining the revenue from the several sources. Such contracts are in effect on the following branches: Bolles, Neb., to Dayton; Columbus to Norfolk, Julesburg to Bushnell, and Lincoln to Beatrice.

In addition to its intercity bus service, the Union Pacific has motor bus service from the rail-head at Cedar City, Utah, to the several national parks in Southern Utah and northern Arizona, namely, Zion National Park, Grand Canyon National Park, and Bryce Canyon National Park. This service is operated by the Utah Parks Company, a subsidiary of the Los Angeles & Salt Lake. The Utah Parks Company also provides a bus service substituted for rail service between Cedar City, Utah, and Lund, and between Delta and Fillmore.

Another subsidiary of the Los Angeles & Salt Lake, the Union Pacific Stage Company of California, operates bus service in substitution for steam train service on several lines radiating from the East Los Angeles, Cal., passenger station. These lines extend south to Long Beach, north to Pasadena and southeast to Anaheim. This service is operated entirely in substitution for train service. The railway receives all the revenue, paying the stage company for the service at actual cost.

The Union Pacific Stage Company, with eight motor buses, operates over 75 miles of interstate routes. The Utah Parks Company, with 65 motor buses, covers 459 miles of intrastate routes, and 195 miles of interstate routes.

# International Harvester Brings Out Two New Trucks

THE International Harvester Company, Chicago, has in production two new 1½-ton trucks, model A-2 and Model B-2. Model A-2 is built with two wheelbases, 136 in, and 150 in. Both wheelbases have a body allowance of 1,200 lb. and a maximum carrying capacity, including body and pay load, of 4,200 lb.

Model B-2 is built only in the 136-in. wheelbase. It has a maximum gross carrying capacity, including body and pay load, of 4,200 lb. for commercial service. Both of these trucks employ the same units throughout with the exception of rear axles and transmissions, model A-2 having a single-speed, spiral-bevel drive rear axle, and model B-2 a two-speed axle, which, coupled with the three speeds of the transmission, provides six forward and two reverse speeds. Model A-2 has a four-speed transmission with one reverse, and model B-2 has a three-speed transmission.

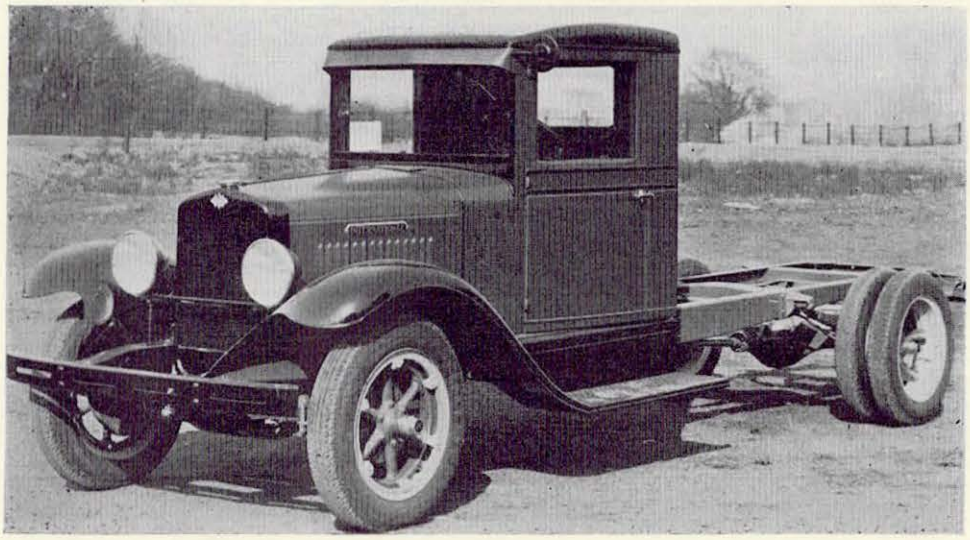
Both trucks are powered by a four-cylinder, L-head type engine, which develops 39 brake hp. at 2400 r.p.m. A gear-type, gear-driven oil pump gives pressure feed lubrication to all main, camshaft, connecting rod and wrist pin bearings. Both trucks are fitted with a balanced-flow type carburetor, and a specially designed cylinder head.

The 136-in. wheelbase chassis have heavy pressed steel channel side rails, 5⅞-in. deep, with 2¾-in. flanges. On the 160-in. wheelbase model A-2, the frame depth is 7 in. and the flange width is 2¾ in.

# How Can Railways Recover Lost Freight Traffic?

*(Continued from page 295)*

of what existing rail rates may be. (3) The rates should include pick-up and delivery service. Rail rates reduced to a point where such rail rates plus drayage charges, equal truck rates, will not answer the purpose. The shippers want complete service from store door to store door, and they want it all included in one transaction. (4) The rates should be governed by a classification much more liberal than the usual railroad classification, and packing rules should be lenient and flexible. The Pacific Motor Transport Company uses the same classification and the same packing, marking, and shipping rules that are used by many of the franchised truck carriers in California. A package that is safe for carriage should not be rejected because of some technical failure to comply with a rule. Experience has indicated many shipments moved safely by the Pacific Motor Transport Company service, without any packing, upon which railroad-required packing would have cost more than the freight charges. (5)



One of the New 1½-Ton International Trucks

The carrier should stand ready to accept shipments up to a late hour in the evening, and should provide service no slower than that offered by the truck carriers. Included within this are fast train service between terminals, and delivery immediately upon arrival at destination. The Pacific Motor Transport Company makes its expense bills at the point of origin instead of at destination, thus avoiding any delay at the destination station, and deliveries are on the street, in many cases, 30 minutes after the car is spotted at the destination freight station. (6) The carrier should stand ready to provide those many trivial personal services, of apparent insignificance to the railroad but of first importance to the patron, which he has been educated by the truck carrier to expect."

## Rate Hearing at Atlanta

*(Continued from page 292)*

could stand no further overhead expense to counteract the deep economies already put in effect, was given on August 19. The plight of southern nurserymen was also described by C. T. Smith, of Concord, Ga., representing the Southern Nurserymen's Association, with a membership extending from Virginia to Texas and from Kentucky to Florida.

### Florida Testimony

The Florida witnesses were Fred Pettijohn, accountant for the Florida Railroad Commission; F. C. W. Kramer, representing the Leesburg Truckers Association, and W. T. Bennett, Bradenton, Fla., secretary-treasurer of the Manatee County Growers Association. Mr. Smith was of the opinion that more economical administration of the carriers along lines similar to other industries, including drastic reductions in salaries, "from presidents to office boys," would in a large measure dispel the emergency described in the railroads' petition. His testimony concerning diminishing profits among the association membership was similar to that of other witnesses representing agricultural organizations.

Drastic falling off of passenger traffic to Florida in 1930 caused a far greater loss of profit to the carriers than general business depression and all other factors combined in that state, Mr, Pettijohn testified. The reduction in passenger traffic volume caused a loss of potential profits totaling many millions of dollars, he said and presented many exhibits from the Florida Railroad Commission purporting to back up his statements.

Conferences between growers organizations and steamship interests, looking towards the creation of steamship lines with refrigeration service, to move the agricultural tonnage of the entire south Florida area to points as far north as Pittsburgh, Pa., are already under way, in anticipation of the granting of the 15 per cent increase, which Florida shippers cannot absorb, Mr. Bennett told the commissioner. He complained that rates are already too high and that a discrimination exists in favor of far western shippers over Florida shippers.

The witness, Kramer, testified that Florida fruit and produce is now being moved north as far as Canada by truck, at a profit and that this means of transportation, already on the increase, would be generally adopted in that state, should rail rates increase. His association now ships about 50,000 cars annually, he said.

It was the witness's opinion that if railroads would practice still greater economies, "such as we are practicing," the carriers would find some relief, but that increased rates would mean the loss of millions of tons of freight and a consequent further reduction in their earnings that would more than offset the rate increase.

Sam Tate, president of the Georgia Marble Company, said his company would "pull through somehow," even if the increase is granted. He warned however, that his organization would turn to water transportation wherever possible.

Harry Moore, traffic manager of the Atlanta Freight Bureau, a witness Monday, was recalled to the stand and expressed the opinion that the railroads would fare better if the statutes setting up their minimum income standards were repealed, adding that the roads should "go out and sell their wares as other concerns must do, instead of attempting to eliminate competition in other forms of transportation." C. R. Moffett of the Knoxville, Tenn., Traffic Bureau, said shippers in his territory would turn to motor trucks in far greater numbers than they are doing at present. J. D. Oliver of the Birmingham Slag Company, said his concern would be driven from certain lucrative markets, particularly in the Carolinas. W. G. Womble of the North Carolina Corporation Commission, suggested a flat increase per car load in lieu of a percentage increase.

Higher rates will be an insuperable barrier to agricultural recovery, W. A. Graham, North Carolina commissioner of agriculture said, while J. W. Cone, North Carolina manufacturer and financier, expressed the opinion that the carriers are as well off, if not better off, than any other industries, their prices having been regulated by the government, while in other industries, prices had been slashed to shreds. The proposed increase would complete the job of making it impossible for southern steel and iron mills to compete with those in the north, W. B. Lewis, of the Alabama Steel & Iron Conference said. He was supported in his stand by E. M. Cole of the Alabama Pipe Association. S. L. Yerkes, spokesman for the Alabama coal mine operators, said coal sales had already dropped 40 per cent since 1929, due to fuel oil and natural gas competition and that coal would be completely eliminated as a competitor under the rate hike. Charles E. Cotterill, general counsel of the Southern Traffic League, Atlanta, held that the plight of the roads is due more to a loss of 65 per cent in passenger traffic in recent years than to industrial depression, although admitting that truck competition was also a factor. He insisted that a permanent advance in rates instead of a temporary emergency increase is the logical solution, "or else the railroad managements must radically change their thought and attitude toward meeting the changed conditions."

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THE SATURDAY REDUCED FARE TICKETS sold by the New York Central from eastern points to the central western states are now accepted on three of the 20-hour New York-Chicago trains; but not on the Twentieth Century Limited. The usual extra fare for fast time must be paid.

THE NEW BATTERY OF FOUR CONCRETE AND STEEL BASCULE BRIDGES, carrying the eight main line tracks of the Boston & Maine to and from the North station, Boston, Mass., were placed in service on August 3. Work in connection with the construction of these bridges involved making a change in the channel of the Charles river.

# Odds and Ends . . .

### Presidential Special

On the occasion of the recent mid-western trip of President Hoover to Indianapolis, Ind., Marion, Ohio, and Springfield, Ill., the Chesapeake & Ohio operated the eight-car Presidential special from Cincinnati, Ohio, to Washington, D. C., 598 miles, in a new record time of 13 hours and 20 minutes. The special also moved over the Big Four and the Wabash at various times during the trip.

### With Grant at Richmond

John O. Goodsell, assistant general passenger agent of the Union Pacific at Omaha, prizes among his possessions the camp chair that was used by Gen U. S. Grant throughout his campaigns around Richmond, Va., during the Civil war. Except for the fact that the bottom has been renewed, the chair has been preserved in its original state. It was presented to Mr. Goodsell's uncle by General Grant following the surrender of Lee at Appomatox.

### Where Are the Smacks of Yesteryear?

A columnist on the Cincinnati "Enquirer" spent a day not long ago in the Union station at Cincinnati and returned with the dismal report that the kisses exchanged by those departing and those staying at home were far below par in quality as well as quantity. This writer reports scores of wasted opportunities, but mentions one young man who waited too long after the "all-aboard" signal and scored a bull's-eye on the side of a sleeping car.

### Locomotive Numbering

If the old woman who lived in a shoe had thought of the plan of numbering rather than merely naming her children, she might never have reached the state of confusion legend attributes to her. However, the old tale was useful as a warning, and it was not long after the inception of railways that the authorities began to give numbers as well as names to their engines. Later on, as the family of locomotives multiplied, names were abandoned except in a few distinguished cases, and only numbers counted. The English-speaking peoples numbered their engines simply, without trying to use the figures to describe different types. Across the Channel, our neighbors, less fearful of complications than we, have numbered their locomotives in such a way that the numbers convey information, more or less complete, as to the type of machine bearing them. In France, the wheel arrangement is frequently quoted. In some of the Central European countries, certain of the numbers represent by their arrangement in conjunction with letters almost a complete description of the locomotive. It is interesting in this connection to observe that the Southern Railway [of England], which, since the amalgamation, has numbered the locomotives of its three constituent companies in the original manner, adding only a small letter, A, B, C, representing Ashford, Brighton, or Eastleigh, to distinguish the engines of one group from those of another, has now achieved such a measure of inter-working that it has become simpler to abandon the letters and add 1,000 to the numbers of the Eastern section and 2,000 to those of the Brighton section.—From "Railway Gazette" (London).

### More About "The Ghost Train's Successor"

CHICAGO.

TO THE EDITOR:

Supplementing the "Odds and Ends" item, "The Ghost Train's Successor", appearing on page 106 of the *Railway Age* of July 18, in which Dr. Frederick S. McKay said, "The locomotive hauling this train was a Rogers 4-4-0 type and bore the New England number 185, or possibly 183 or 184":

Doctor McKay is quite correct in this statement, but the locomotive referred to was a Rogers No. 183, operated by Engineman E. E. Potter. His fireman's name I have forgotten, but just prior to his promotion, he took a leave of absence and went to the Yukon in the 1898 gold rush and was never heard from afterwards.

Locomotive 183 was transferred to the run of the old "Ghost Train", as Doctor McKay states, when it was advanced to one o'clock out of the Park Square station for Readville. Several months later, General Master Mechanic F. B. Smith, under direction of Superintendent of Motive Power John Henney of the New Haven, replaced Rogers Locomotive 183 with a New Haven locomotive, No. 129, of his own design. This was subsequently taken off the run and replaced by Schenectady locomotive No. 902. Previously, however, when the run, formerly from Boston to Willimantic, Conn., and return, was extended through New Haven, Engineer Potter ran locomotive No. 129 and Engineer Langdon ran locomotive No. 128.

As stated by Doctor McKay, locomotive No. 183 carried two headlights and later both locomotives No. 128 and 129 were equipped with double headlights as a means of identification over the single track of the New York and New England, now the Willimantic division of the New Haven.

H. E. DANIELS,
Manager Railroad Department, West Disinfecting Company.

### Adding Insult to Injury

Just how quiet things are these days along the railroads is indicated by a report from Hobart, Ind., that a ring-necked pheasant has located her nest within a few feet of the Pennsylvania main line at that point, and another from Augusta, N. J., to the effect that a robin has built a nest and raised a family in the air-brake compressor of one of the Lehigh & New England's gasoline locomotives. We have been aware that the railroads are not getting as much business as they would like to have, but it is discouraging to know that they are so idle that birds are building nests on them.

### An 1891-Model Switch Key

LITTLE ROCK, ARK.

TO THE EDITOR:

While reading the *Railway Age* for July 4, I came across an item in your "Odds and Ends" column concerning a switch key, said to have belonged to a bridge carpenter employed on the Southwestern division of the St. Louis-San Francisco, which was recently turned into their stores department after having been in use for a period of 47 years.

Quite coincidentally we have experienced a case of this kind here on the Arkansas division of the Missouri Pacific. It developed just a day or two ago when a fellow named J. T. Nevels, an old-time brakeman on the Missouri Pacific, came into my office and delivered a switch key, No. A-1244, which was issued to him on August 24, 1891, almost 40 years ago. Mr. Nevels also presented the original deduction order which he signed at the time he received the switch key, authorizing a deduction of one dollar from his wages from the current payroll of that date. The deduction order had been carefully preserved and was practically as fresh and new as when it was issued. The key and order were returned for a refund of the dollar paid for the key.

Mr. Nevels was employed as a brakeman at various times for a number of years, and ultimately left the service to take a position with the Little Rock police department. He belonged to the old school of boomer trainmen, and intermittently plied his trade on many and sundry lines of railroad, always leading the nomadic existence of the typical railroader of that period.

This man also delivered an old coupling knife along with the switch key, which, in itself, constitutes something of a novelty in this day of automatic couplers and safety appliances. Coupling knives went into the discard along with the link and pin coupling and corkscrews of pre-Volstead days. It was, however, one of the essential articles of equipment in the hectic years of railroading, and there are still a few of the old-timers left whose memories hark back to those earlier times.

W. E. LAMB,
Superintendent, Missouri Pacific.



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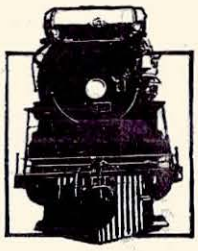
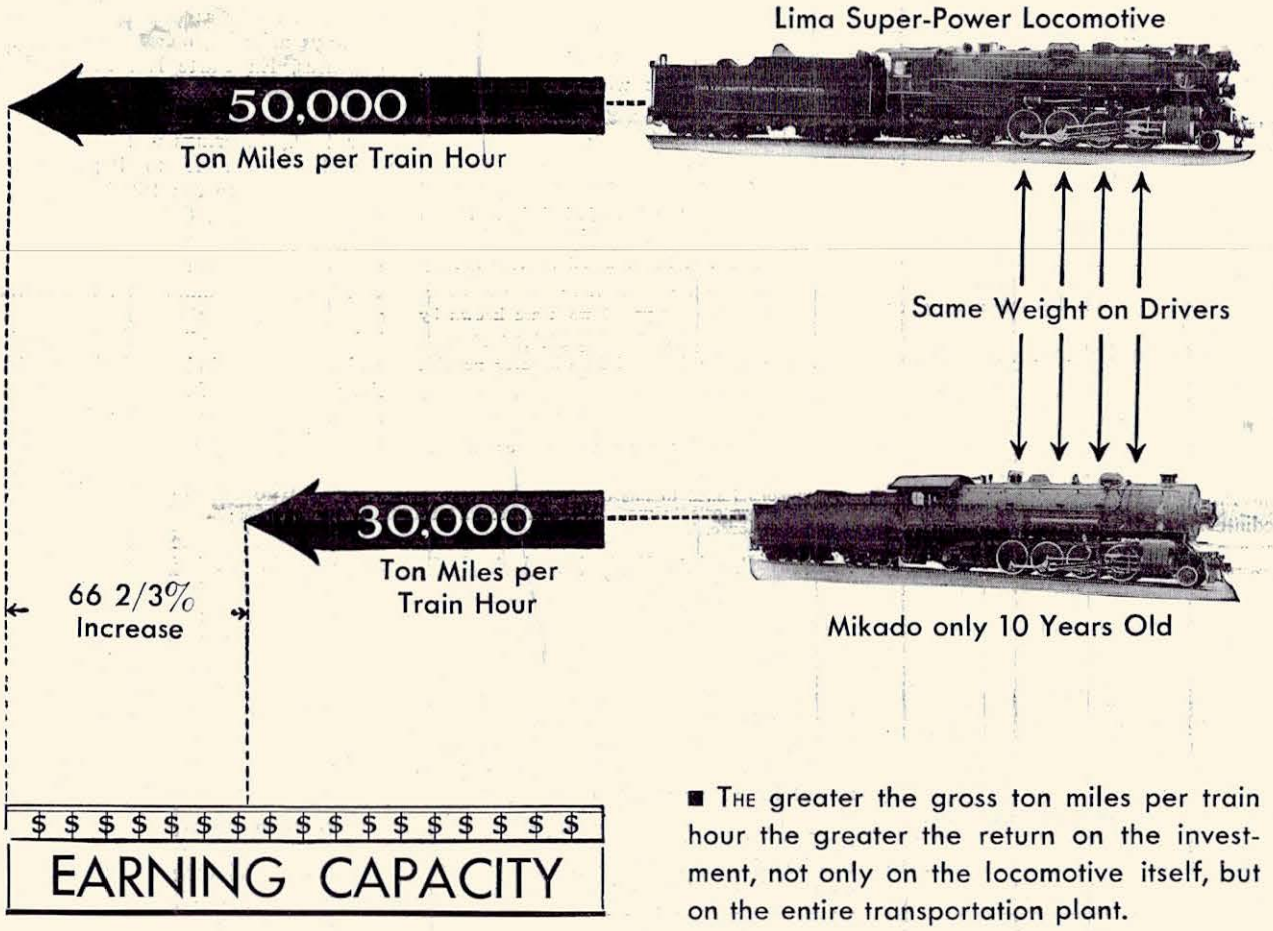


# Measure Locomotive Performance With This Yard Stick


Lima Super-Power Locomotive
50,000
Ton Miles per Train Hour
Same Weight on Drivers
30,000
Ton Miles per Train Hour
66 2/3% Increase
Mikado only 10 Years Old
$ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $
EARNING CAPACITY

■ The greater the gross ton miles per train hour the greater the return on the investment, not only on the locomotive itself, but on the entire transportation plant.

## LIMA LOCOMOTIVE WORKS

**Incorporated**

LIMA OHIO

LIMA LOCOMOTIVE WORKS INCORPORATED

# NEWS

## Summary Arrest for Reckless Bus Drivers

### No more summonses in N. J. for interstate operators who violate traffic laws

Calling attention to a "serious situation" which has been brought about "by the speeding and reckless operation of buses upon the White Horse Pike" between Camden, N. J., and Atlantic City, Harold G. Hoffman, New Jersey commissioner of motor vehicles, in a recent bulletin, suggests that, if magistrates would refuse leniency to law-violating bus drivers, the "improper operation of buses would be quickly curbed." The issuance of the bulletin follows an official survey made by the Public Utility Commission, which shows that "a majority of these buses are operating far in excess of the speed limits and drastic steps must be taken at once to curb this menace."

Attached to the bulletin, which is addressed to magistrates, chiefs of police and inspectors of the department of motor vehicles, is an opinion of the Attorney General of New Jersey to the effect that operators of buses on routes not approved by the Public Utility Commission can be immediately arrested, whereas a bus driver on an approved route can only be served with a summons for a violation of the Traffic Act. The bulletin points out in this latter connection that buses on unapproved routes include all those handling interstate passengers.

The bulletin follows in full text:

A serious situation has been brought about by the speeding and reckless operation of buses upon the White Horse Pike. There have been a number of fatalities. An official survey made by the Public Utility Commission shows that a majority of these buses are operating far in excess of the speed limits and drastic steps must be taken at once to curb this menace.

I append herewith an opinion rendered by the Attorney General to the effect that operators of interstate bus lines running over routes not approved by the Public Utility Commission (this includes all buses picking up passengers in one state and discharging at a terminus in another state) may be immediately arrested in the same manner as any other offender of the law.

I keenly feel the responsibility of our own department in this matter, and likewise feel that local police and judicial agencies should take cognizance of the seriousness of the situation and should show no leniency in dealing with these offenders who endanger life and property. Our department has but a very limited number of inspectors who are available for this work. They will be urged to give especial attention to improper operation of buses but when the offenders are arraigned in the local courts we will expect the Magistrates to do their full duty, and see that commensurate punishment is meted out. Where we have a consistent record of violations, I propose to take steps to bring about the revocation of the bus registrations.

Local police officers can be of great assistance in curbing this evil. In some of the municipalities along the White Horse Pike the police officers are so vigilant that bus operators proceed with a great degree of caution within the territorial limits over which they have jurisdiction. If this policy were followed in every municipality, and if the Magistrates would all refuse leniency, improper operation of buses would be very quickly curbed.

The few regular Inspectors of our department who are available for patrol work are known by the bus operators and drive state cars. Special Inspectors of the Department are requested to patrol the White Horse Pike whenever possible and to apprehend offending bus operators. Summons books will be supplied for this purpose upon request. Special Inspectors are generally not known to the bus operators and operate upon automobile tags that are not easily recognized.

I would appreciate having from all Inspectors and Police Officers a record of every arrest made or summons issued to bus operators. Please address these reports to me marked "Personal," at the State House, Trenton.

### R. F. & P. Plans Richmond-Washington Truck Route

The Richmond, Fredericksburg & Potomac plans, on September 1, to inaugurate a motor truck route paralleling its rail line between Richmond, Va., and Washington, D. C., according to an announcement issued on August 15. It is planned to inaugurate the new service with one daily round trip between Richmond and Washington; local traffic will also be handled. Two large motor trucks will be used at the outset.

### Beatty Predicts Early Regulation of Canadian Highway Carriers

Prospects for the early enactment of legislation designed to afford equalized treatment for competing agencies of transportation seem at present to be brighter in Canada than in the United States. E. W. Beatty, chairman and president of the Canadian Pacific, in a recent interview at St. John, N. B., expressed himself as being "reasonably confident that in a few months measures will be adopted which will regularize the competition existing between the railways and motor bus and truck traffic, and that such measures may perhaps result in the co-ordination of rail and motor services in certain districts.

"Both the Canadian Pacific and Canadian National Railways," Mr. Beatty continued, "are investigating the bus and truck situation in order that they may be able to meet this form of competition in the most effective manner. The first step would seem to be that sufficient regulation of bus and truck services should be insisted upon by the provincial authorities and also that fair charges should be imposed upon these companies for the use of the public right of way in the form of provincial highways."

## Dates Announced for Practices Investigation

### I.C.C. to hold first fall hearing in Ex Parte 104 at Boston September 15-19

The Interstate Commerce Commission has announced a series of hearings to be held this fall in connection with its investigation of "certain practices" of the railways affecting operating revenues and expenses, Ex Parte No. 104, to be held before Director W. P. Bartel of its Bureau of Service and Examiner C. M. Bardwell. Hearings will be held at Boston, September 15 to 19; New York, September 22 to 30; Pittsburgh, October 5 to 17; Buffalo, October 20 to 23; Detroit, October 26 to 30; Cincinnati, November 2 to 7, and Chicago, November 10 to 24. The commission has addressed questionnaires to the railroads calling for information regarding the construction or maintenance of industrial side-tracks and the purchase of fuel, including information as to fuel companies in which the railroads have an interest, and has issued the following notice regarding Part II of the investigation, pertaining to terminal services:

"This part of the general inquiry, in scope and restriction, is to establish facts concerning the following services, charges, and practices, viz:

(1) Present terminal services and practices in the receipt and delivery of carload and less-than-carload freight, including the switching and spotting of cars, loading, unloading, storage, elevation, reconsignment, and all other services and privileges, except transit and lighterage, incident to such terminal services, which, within the meaning of section 6 of the interstate commerce act, affect the measure of the transportation service performed at the line-haul rates and the value of such services to consignors and consignees;
(2) the applicable charges, if any, established for such services;
(3) the extent to which the line-haul rates include charges for such services;
(4) allowances and absorptions made out of the line-haul rates;
(5) the extent to which such services reach beyond respondents' terminals to particular locations on private track sidings, industrial plant tracks and on the rails of industrial common carriers;
(6) the detention of cars at the terminals as incidents of the foregoing services;
(7) the extent and particulars in which private industrial railroads and industrial common carriers are used, at respondents' expense, in receiving traffic and effecting delivery thereof;

"Unless and until notice is otherwise given this part of the inquiry will be confined to Class I railroads.

"The object of the inquiry being to ascertain generally the prevailing practices in rendering the described terminal services, and incidents thereof the notice says, a sufficient response will be made by de-

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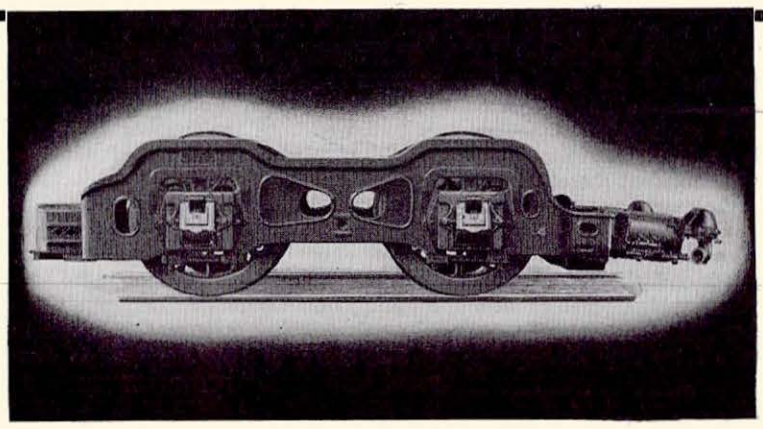
# THE ECCENTRIC BROKE!...*but the* BOOSTER *brought them in*



● THE LOCOMOTIVE BOOSTER

BOOSTER LOCOMOTIVE No. 83 with 137 cars behind her was rolling along when the eccentric rod broke. The crew removed the pieces and disconnected one side of the engine.

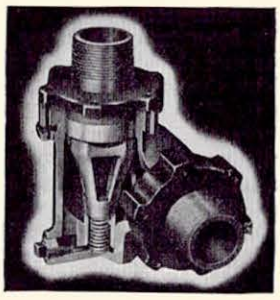
Then with the Booster adding its emergency power, No. 83 brought the whole 137 cars the remaining 30 miles to the terminal.

Besides adding starting power when needed to get a tonnage train under way—The Locomotive Booster smooths operation. Its extra power pulls the operating department out of many a tight place.

In keeping with the demands of modern railroad operation, specify The Locomotive Booster on every locomotive you build.

THE FRANKLIN SLEEVE JOINT

A reliable conduit, free from limitations in movement, permitting short vertical pipes and greater rail clearance.



**FRANKLIN RAILWAY SUPPLY COMPANY**

**INCORPORATED**

NEW YORK CHICAGO ST. LOUIS SAN FRANCISCO MONTREAL

scribing and defining typical examples—separately in reference to each respondent and each class of the described services rendered at the larger terminals and industrial centers along the railroads of the respective respondents; provided, however, that where practical an informed officer or officers to make general response for all carriers may be delegated in circumstances where, relating to particular services, and the industries served, the nature of the services and governing practices are identical or generally the same; such, for example, as the spotting of cars without charge in addition to the line-haul rate on ordinary private sidings or spurs as distinguished from like services on systems of private industrial plant tracks or through industrial common carriers.

"In relation to the described services, particularly those rendered by use of cars and locomotives in switching at the terminals, especially where occasioned by meeting conveniences of the consignors or consignees—such as holding cars for disposition orders, spotting or removing cars from particular locations at particular times, and services incident thereto—it is desired that, to the extent practicable, an approximation of the time consumed in rendering such services be given, expressed in engine-hours with reference to the units of traffic handled, together with engine-hour costs that may have been developed by studies from time to time."

## Enginemen and Firemen to Meet in Cincinnati

The Brotherhood of Locomotive Enginemen and Firemen, at the closing session of its 1931 convention at Canton, Ohio, on August 13, selected Cincinnati as the place for its 1932 convention.

## Cincinnati & Lake Erie Cuts Wages

A 10-per cent cut in the salaries of all employees of the Cincinnati & Lake Erie, except those of freight and passenger crews, became effective August 15 as an emergency measure for six months, when it is hoped that conditions will be such as to warrant a return to the present scale. The cut affects 400 employees.

## N. Y. Barge Canal Reports Traffic Increase

The New York State Barge Canal, for the 1931 period ending July 25, reported an increase in traffic of 15,926 tons, or one per cent, as compared with the corresponding period of 1930. During 1930 this canal reported a record business when it handled 3,605,457 tons, as against 2,876,160 tons handled in 1929.

## Katy Cuts Salaries

The Missouri-Kansas-Texas, effective August 15, has made a general reduction in the salaries of officers and unorganized employees because of the general business depression reflected in decreased car loadings and diminishing revenues. Officers and supervisors earning more than $5,000 a year have taken cuts ranging up to 20 per cent, while those earning less than $5,000 have been cut 10 per cent. The policy does not affect workers whose wages are covered by agreements with organizations of which they are members nor organized clerks and others who for several months have worked five days a week and received pay on a five-day week basis.

## Boston-Maine Airways Increase Service

To accommodate increasing passenger traffic, the Boston-Maine Airways, Inc., a joint subsidiary of the Boston & Maine and Maine Central recently incorporated to offer air passenger service, in connection with Pan American Airways, Inc., between Boston, Mass., and Maine points, has added one round trip daily between Boston and Portland, Me., and has included Rockland, Me., in the service in both directions.

## Another Reduction in Number of Railway Employees

The number of employees of Class I railways as of the middle of the month of June was 1,317,407, a reduction of 20,000 as compared with the number as of the middle of May. As compared with the corresponding month of last year this was a reduction of 15.78 per cent, and as compared with June, 1929, it was a reduction of 24.12 per cent. For May the total compensation was $186,713,283, according to the Interstate Commerce Commission's monthly statement, a reduction of $42,915,373, or 18.69 per cent as compared with the corresponding month of last year, while the decrease in the number as compared with May, 1930, was 264,154, or 16.49 per cent.

## Solarium Cars on North Western

The Chicago & North Western has placed in service two solarium observation lounge cars, which were recently reconstructed by the Pullman Car & Manufacturing Corporation. These operate on the Duluth-Superior Limited, north-bound, and the Arrowhead Limited, southbound, between Chicago and Duluth, Minn., and Superior, Wis. The solarium is equipped with a love seat and four chairs with swivel bases. The lounge section of the car immediately ahead of the solarium end is furnished with occasional chairs and davenports finished in varied shades of red and green, in addition to a walnut writing desk and a magazine table. The front portion of the car has 12 regular Pullman sleeping sections. The lavatories are equipped with porcelain basins.

## Co-ordination of Transportation Subject of Traffic Club Forum

The co-ordination of transportation services and agencies has been adopted as the subject of continued discussion throughout the year by the Traffic Club of Chicago, the first open forum having been held on August 12. At this meeting, which was presided over by Lewis Sorrell, professor of transportation at the University of Chicago, an effort was made to establish the basic principles involved in the development of any form of transportation. Consideration was given the adequacy of the commonly used methods for studying potential traffic, the adequacy of the accompanying engineering methods of studying the cost of the improvement, and the adequacy of the general formula for determining the wisdom of any proposed improvement. The two forms of transportation involved at the first meeting were waterways and railways.

## Halt Charter to Force Grade Separation

The City Council of Chicago, on August 17, adopted a resolution calling upon the governor and secretary of state to refuse to renew the charter of the South Chicago Railroad Company, which expires on September 10, as a means of forcing the Illinois Central, the parent company, to depress the tracks of the South Chicago branch. The I.C. has offered to elevate its tracks and is willing to depress them if property owners will pay the difference between the cost of depression and that of elevation.

## Arbitrators Refuse I. C. Telegraphers' Demands

The request of Illinois Central telegraphers for adjustments of present rates of pay equivalent to an increase of 1-1/3 hr. pay per day for each position covered by an agreement, has been denied by a board of arbitration consisting of Judge Hugo Hanft of St. Paul, Minn., Dr. Davis R. Dewey, professor of economics and statistics of the Massachusetts Institute of Technology and representatives of the employees and the railroad. In refusing an increase of wages, the neutral members of the board were influenced by the fact that there is a general depression in business which may be prolonged and that this is not an opportune time to make increases.

## Rates Reduced to Meet Truck Competition

The Norfolk Southern has been authorized by the Interstate Commerce Commission to reduce its rate on leaf tobacco from North and South Carolina points to Norfolk and Newport News, Va., from 36 to 27 cents on September 1 to meet water and truck competition. Recently the commission declined to authorize a reduction to 25 cents in the rate to Norfolk on the ground that it would be discriminatory against Newport News. Other southern roads have asked the commission for authority to make reductions to meet truck competition in the rates from North and South Carolina points to Charleston, S. C., and Wilmington, N. C.

The Interstate Commerce Commission on August 13 voted not to suspend tariffs filed by the western trunk line and Illinois Freight Association lines establishing greatly reduced rates on refined petroleum, gasoline, kerosene and furnace oil distillate for short hauls in Illinois territory to meet motor truck competition. The railroads pointed out in explaining the proposed reductions that much of this traffic was being diverted

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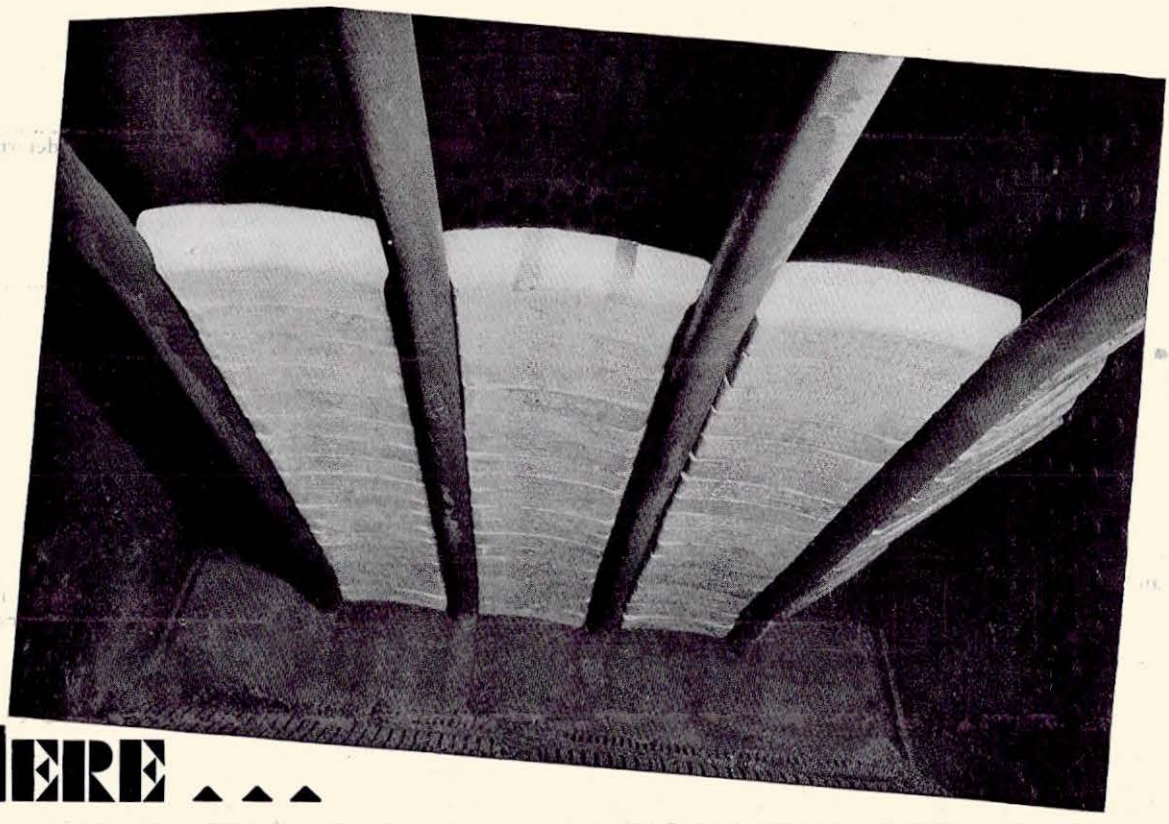
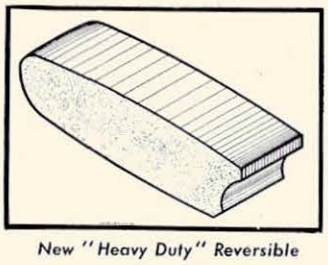
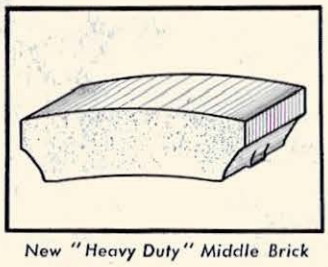


# HERE . . . ARE THE NEW BRICK

## that comprise the "HEAVY DUTY" Arch



*New "Heavy Duty" Reversible Side Brick*



*New "Heavy Duty" Middle Brick*

THESE are the brick that make up the new "Heavy Duty" Arch of the American Arch Co. — an Arch developed for modern motive power to meet the intensified demands being made on the firebox.

A new end construction keeps the center brick in place even under the severe, sudden drafts and the excessive vibration encountered with modern power.

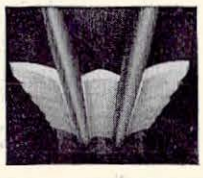
The side brick fit securely and are reversible — a feature that reduces time in installation and makes one pattern do the work of two.

The new Arch brick are more easily handled and, due to their unique design, have already proved their ability to run between washout periods with entire satisfaction.

Ask American Arch Company about the application of "Heavy Duty" Arches to modern power.

**HARBISON-WALKER REFRACTORIES CO.**

» » » » *Refractory Specialists*



**AMERICAN ARCH CO.**

INCORPORATED

60 East 42nd Street . . . . New York, N. Y.

*Locomotive Combustion Specialists*

to trucks and that if they expected to recover it they must act promptly before shippers made new contracts or permanent arrangements for trucking service.

## Plaque for Saving Drowning Girl

Glen C. Pendergast, traveling freight and passenger agent of the Spokane, Portland & Seattle, has been awarded a bronze tablet for saving the life of a two-year old Japanese girl on July 4. The child had been walking on the railroad's trestle over the Columbia river at Astoria, Ore., and becoming frightened at the approach of the train, had fallen into the water. The train stopped immediately and search was instituted under the wheels. Mr. Pendergast, who, with his family, was riding on the train, saw the girl in the water and plunged from the trestle into the river at the risk of his own life and without thought for his own safety. The plaque bears the signature of W. F. Turner, president, and describes in detail the heroic act. The tablet is captioned "An Appreciation."

## A.S.A. Standards Council Appointments

Worth Rogers, superintendent of telegraph, Missouri Pacific, St. Louis, Mo., has been appointed representative of the Operating Division of the American Railway Association on the American Standards Association Standards Council. Mr. Rogers's appointment completes the naming of the three representatives on the Standards Council granted the American Railway Association in December, 1930.

Other changes in personnel include the appointment of J. E. Saunders, signal engineer, Delaware, Lackawanna & Western, as alternate representing the Signal Section of the American Railway Association; L. C. Thomson, manager of stores, Canadian National, alternate representing the Purchases and Stores Division, and H. A. Kidder, Interborough Rapid Transit, New York, alternate representing the American Electric Railway Association.

## Unions Favor Freight Rate Increase

That the railroad brotherhoods will support the proposal that the carriers be granted a 15-per cent increase in freight rates was announced by the heads of the labor groups on August 13. The statement was issued by S. N. Berry, president of the Order of Railway Conductors; Alvanley Johnston, grand chief engineer of the Brotherhood of Locomotive Engineers; A. F. Whitney, president of the Brotherhood of Railroad Trainmen, and David B. Robertson, president of the Brotherhood of Locomotive Firemen and Enginemen. The statement in part follows:

"Railway labor has suffered severely during the present depression. We have endured this in assisting to maintain an essential balance between railway outgo and income. We are convinced that no further immediate economies can be applied.

"We have carefully considered the application of the railroads for a general increase in rates and have concluded that, should the Interstate Commerce Commission wisely determine to grant the increase requested, such action will have a beneficial effect upon general business conditions. We maintain that, through the authority to restore revenues requested by the railroads, the commission can provide a new stimulus to strengthen and support the business of the country."

## Tomatoes Must Be Loaded Crosswise

The Interstate Commerce Commission, as of August 15, vacated its order of March 20, 1931; suspending tariffs which provide that the loading of fresh vegetables and melons shipped in lugs from points in Arkansas, Louisiana, Oklahoma and Texas be crosswise in the car. The carriers published schedules on February 6, 1931, governing the loading of interstate shipments of fresh vegetables and melons in lug boxes and, upon the protest of the Lower Rio Grande Valley Shippers Association, the commission suspended the operation of the schedules until October 20. The shippers declared that the cross loading of vegetables, particularly tomatoes, causes a deterioration during transportation because of restricted ventilation. The commission found the tariffs justified.

The filing of tariffs by the carriers serving the above states follows the adoption of similar tariffs in Florida, Georgia, South Carolina, North Carolina and Virginia. Tariffs were also filed in Mississippi and Tennessee, but were withdrawn when shippers protested. The adoption of tariffs requiring the cross loading of lugs of tomatoes has resulted in a decrease in claim payments wherever tried, and if adopted universally would no doubt result in a large saving. During 1930 approximately 40,000 cars of tomatoes were transported by the railroads and the claims paid averaged $40 per car.

## Great Northern's New Ticket Office

Several innovations have been incorporated in the new ticket office recently opened by the Great Northern at St. Paul, Minn. The office is air-cooled and the furnishings are designed to create the atmosphere of its transcontinental train, the Empire Builder. All business is transacted from comfortable chairs and at attractive desks, the familiar standing counter being omitted from the main portion of the office. The customary safe and the coupon cabinet have also been concealed.

## July Locomotive Shipments

July shipments of railroad locomotives from principal manufacturing plants, based on reports received by the Department of Commerce, totaled 13 locomotives, as compared with 19 in June, and 56 in July, 1930. The following table shows shipments and unfilled orders of locomotives for July, 1930, and 1931, the 1930 totals and totals for the first seven months of the two years.

Railroad Locomotive Shipments

| Year and Month | | Domestic | | Foreign | |
|---|---|---|---|---|---|
| 1931 | Total | Steam | Electric | Steam | Electric |
| July | 13 | 11 | 1 | 1 | .. |
| Total (7 mos.) | 114 | 93 | 19 | 2 | .. |
| 1930 | | | | | |
| July | 56 | 52 | 3 | 1 | .. |
| Total (7 mos.) | 479 | 454 | 10 | 12 | 3 |
| Total (year) | 763 | 706 | 33 | 17 | 7 |

Unfilled Orders, end of May

| | | Domestic | | Foreign | |
|---|---|---|---|---|---|
| | Total | Steam | Electric | Steam | Electric |
| 1931 | 86 | 20 | 55 | 11 | .. |
| 1930 | 291 | 243 | 41 | 3 | 4 |

## Allowances for Off-Track and Interchange Services at St. Louis Approved by I.C.C.

The Interstate Commerce Commission has issued a report approving the allowances for off-track and interchange services at and between St. Louis and East St. Louis embodied in a contract between an agent for the railroads serving those cities and the Columbia Terminals Company, following a cost study. The commission had previously approved the plan to employ a single transfer company in the operation of off-track stations and the haulage between such stations and on-track stations and in interchange. The Alton, the New York, Chicago & St. Louis and the Litchfield & Madison did not concur in the contract and the allowances for direct-delivery service from East St. Louis to St. Louis

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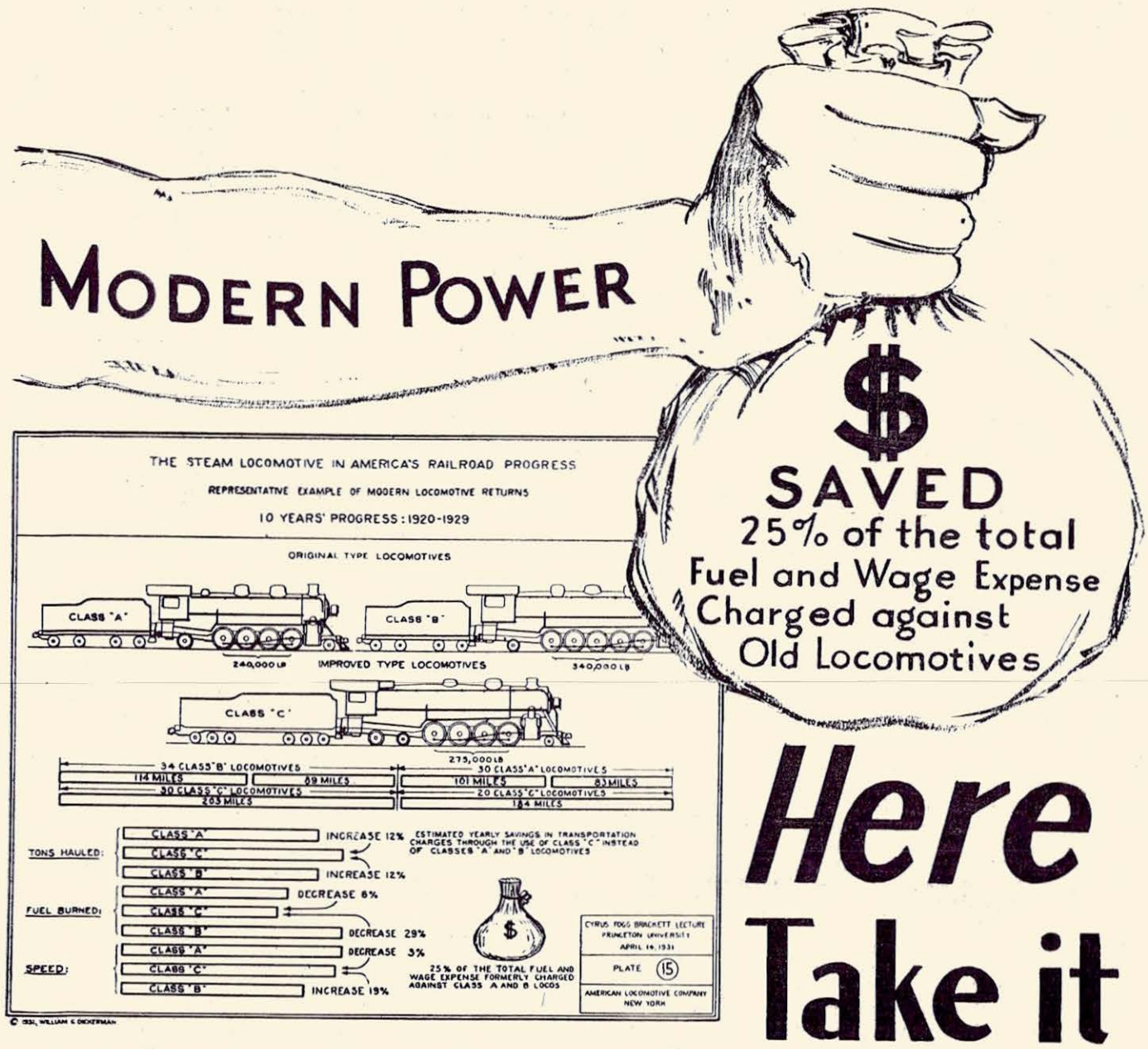
# MODERN POWER




# Here Take it

*To Economize Modernize*

IT'S YOURS if you modernize. We say modern power will do and save only what it has done and is doing in actual service. The above chart represents a typical example of how one railroad saved 25 per cent in transportation expense by modernizing.

Here are the facts. 30 locomotives designated as Class "A" were in freight service on divisions of 101 and 83 miles; 34 locomotives designated as Class "B" were in service on adjacent divisions of 114 and 89 miles respectively. 50 locomotives of new design and with greater power designated as Class "C", replaced these 64 older locomotives and handled the same tonnage, on faster schedule and with longer engine runs over two divisions combined, namely: 184 and 203 miles at a saving of 25 per cent in transportation expense.

A 25 per cent saving in these days is big enough to justify a thorough examination of your equipment. Modernize—the profits now lost will pay the cost.

**American Locomotive Company**
**30 Church Street New York N.Y.**

proposed by the Alton were found not justified. The allowances proposed in the contract for the direct delivery service are 2 cents per 100 pounds for less-than-carloads and 1 cent for carloads. Commissioner Eastman wrote a vigorous dissenting opinion criticizing the methods by which the cost study was conducted and the contract entered into. He suggested that the Railway Express Agency was an instrument ready at hand, and might easily have been adapted to perform the service.

## Upper Berth Rates to Be Reduced Experimentally

The Pullman Company and the railroads concerned have been authorized by the Interstate Commerce Commission to make an experimental reduction in the rates for upper berths in sleeping cars to half the rate for lower berths, effective on August 20 for a three-month experimental period, between Washington and New York and Jersey City and between Chicago and St. Paul and Minneapolis. This is with a view to ascertaining whether such a reduction will tend to stimulate the use of upper berths. Since February, 1911, the upper berth rate has been 80 per cent of the lower berth rate and before that the rates were the same. According to the Pullman Company's application for authority to make the reduction effective on short notice, in order that a part of the summer travel period may be included, "the reduction of 1911 has not produced during the 20 years the differential upper berth rates have been in effect a material increase in occupancy of upper berths. It is desired to ascertain whether under the conditions that exist at this time a materially lower basis of charge would produce sufficient additional demand for such accommodations as to create additional revenue and permit operating economies should an increased occupancy of upper berths permit the furnishing of desired accommodations in a lesser number of cars, all of which requires an actual experiment."

## Canadian Pacific Wrests Train Speed Honors from Britain

The Canadian Pacific by the recent reduction in the running time of its "Canadian" between Montreal West and Smith's Falls, Ont., and the similar acceleration of its "Royal York" in the opposite direction between the same two points has wrested from the Great Western of Great Britain the distinction of operating the fastest train in the world.

The average speed of the Canadian over the 124-mile run between Montreal West and Smith's Falls is 67.6 miles per hour while the Royal York makes the run in the opposite direction at an average speed of 68.9 miles per hour. The record held by the Great Western of Great Britain was based on the 77¼-mile run between Swindon and Paddington (London) over which one of its trains operates in 70 minutes, or at an average speed of 66.3 miles per hour.

The foregoing data on the C.P.R. trains are taken from the latest issue of the Official Guide. This shows Train No. 19—the Canadian—scheduled to leave Windsor station, Montreal, for Chicago daily at 3:00 p. m. At Montreal West it "stops to take for Belleville and beyond." When this Montreal West stop is made, the schedule calls for the Canadian's departure from there at 3:10 p.m. and its arrival in Smith's Falls at 5:00 p.m.—a distance of 124 miles covered in 110 minutes. Train No. 38—the Royal York—on its run between Chicago and Montreal is scheduled to leave Smith's Falls daily at 7:45 p.m. and to arrive at 9:33 p.m. in Montreal West where it "stops to leave from west of Smith's Falls." The Royal York's running time for the 124 miles between the two points is therefore 108 minutes and its average speed 68.9 miles per hour.

Prior to the speeding-up of the schedules the Canadian left Montreal West at 1:10 p.m. and arrived in Smith's Falls at 3:15 p.m., covering the 124 miles in 125 minutes. Its schedule between the two points has therefore been shortened by 15 minutes. The Royal York formerly made the 124-mile run between Smith's Falls and Montreal West in 122 minutes; its present schedule is 14 minutes shorter.

The speed supremacy of these Canadian Pacific trains over that of the Great Western of Great Britain is conceded by the Railway Gazette (London) in an editorial entitled "The Fastest Train in the World," appearing in the issue of July 31. This editorial suggests, however, that "the challenge has not passed unnoticed on this side of the water" and adds that "unless anything unforseen takes place in the interim, the month of September next may see the record safely back in British hands."

## Purchases and Stores Division Announces Contest

The Purchases and Stores Division, A. R. A., has announced a contest similar to contests held in previous years for papers on railway purchases and stores work and problems. The contest is open to all employees of railway purchasing and stores departments below the rank of assistant purchasing agent and assistant general storekeeper.

A committee of three, consisting of L. B. Wood, assistant purchasing agent and general storekeeper, Southern Pacific, E. A. Clifford, general purchasing agent, Chicago & North Western, and H. P. McQuilkin, assistant purchasing agent, Baltimore & Ohio, will select two best papers, and the authors will be invited to the 1932 annual meeting of the division.

The subject may be any which is related to the purchasing of material, or the storing and distributing of same. Four typewritten copies must be submitted and should be typed with black record ribbon, double spaced on one side of paper only, and at the top of the first page the subject should be indicated, and the full name of the writer, his title, the railroad and his address.

The article submitted must have at least 1,000 words and not more than 3,000, and the same must be in the hands of the secretary not later than March 1, 1932.

The papers will be judged on the following basis:

Fifty per cent originality of subject, ideas, conclusions and solutions of problems involved.

Twenty-five per cent general interest and importance of subject selected. (Important to select subject that will be of interest to the greater number rather than a subject involving a local condition.)

Twenty per cent conciseness and clearness of expression. (Will also cover question of grammatical construction, etc.)

Five per cent general appearance and neatness. (Necessary for convenience of the committee.)

## Federal Trade Commission Approves Scrap Code

The Code of Business Practices of the Scrap Iron and Steel Industry has been revised in accordance with the recommendations of the Federal Trade Commission which has retained 10 of the 12 rules in the previous scrap code with some modifications of language and has withdrawn its approval of two of the rules. The leading rule of the scrap code, which sets forth "top-dressing" of cars as an unfair trade practice, has been retained and strengthened by the commission. The rules as approved by the Federal Trade Commission are as follows:

Rule 1, Group 1—Top Dressing—The practice of delivering inferior products against contracts to supply scrap iron and steel according to certain specifications by so arranging the shipments in the cars that the inferior products will not be readily discovered on surface inspection, without the consent of the purchaser to such substitutions and with the effect of deceiving or misleading purchasers, is an unfair trade practice.

Rule 2, Group 1—Defamation of Competitors—The defamation of competitors by falsely imputing to them dishonorable conduct, inability to perform contracts, questionable credit standing, or by other false representations, or the false disparagement of the grade or quality of their goods, with the tendency and capacity to mislead or deceive purchasers or prospective purchasers, is an unfair trade practice.

Rule 3, Group 1—Inducing Breach of Contract—Maliciously inducing or attempting to induce the breach of existing contracts between competitors and their customers by any false or deceptive means whatsoever, or interfering with or obstructing the performance of any such contractual duties or services by any such means, with the purpose and effect of unduly hampering, injuring, or embarrassing competitors in their businesses, is an unfair trade practice.

Rule 4, Group 1—Commercial Bribery—Directly or indirectly to give or permit to be given or offer to give money or anything of value to agents, employees, or representatives of customers or prospective customers or to agents, employees, or representatives of competitor's customers or prospective customers without the knowledge of their employers or principals, as an inducement to influence their employers or principals to purchase or contract to purchase industrial products from the maker of such gift or offer, or to influence such employers or principals to refrain from dealing or contracting to deal with competitors, is an unfair trade practice.

Rule A, Group 2—Fulfillment of Contracts—Contracts, either written or oral, are business obligations which should be performed in letter and spirit. The repudiation of contracts by sellers on a rising market, or by buyers on a declining market, is equally reprehensible and is condemned by the industry.

Rule B, Group 2—Overbilling—Withholding from or inserting in the invoice statements which make the invoice a false record, wholly or in part, of the transaction represented on the face thereof, is condemned by the industry.

Rule C, Group 2—Arbitration—The industry approves the practice of handling disputes in a fair and reasonable manner, coupled with a spirit of moderation and good will, and every effort should be made by the disputants themselves to arrive at an agreement. If unable to do so, they should agree, if possible, upon arbitration under some one of the prevailing codes.

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# AMERICAN BRIDGE COMPANY

## STANDARD CONTINUOUS TYPE TURNTABLES

—Consist of a pair of shallow deck plate girders rigidly braced together and supported by the center and circle rail so that they act as a continuous structure on three supports; a wheel at each end of the table is driven along the circular rail by a suitable motor and gearing, making the table a self contained machine. These tables are proportioned for typical engines appropriate for each length and selected to provide large center sections.

Some of the important advantages of the continuous type of turntable are: Much longer locomotives can be turned on a table of given length and no time is lost in balancing them; separate tractors and latches are not needed; the horizontal rigidity of the continuous structure insures correct alignment of the table and approach rails; the pits are shallow and readily drained; the cost of pit construction and the cost of maintenance of the pit and table are less than for the cantilever type.

*Inquiries will be given prompt attention and additional information furnished on request*

U S STEEL

## American Bridge Company

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

**General Offices: 71 Broadway, New York, N. Y.**

**New York, N. Y.:** Philadelphia, Pa.; Boston, Mass.; Baltimore, Md. **Pittsburgh, Pa.:** Detroit, Mich.; Cleveland, Ohio; Cincinnati, Ohio **Chicago, Ill.:** Duluth, Minn.; St. Louis, Mo.; Minneapolis, Minn.; Denver, Colo.; Salt Lake City, Utah

*Pacific Coast Distributors*—Columbia Steel Company: San Francisco, Portland, Seattle, Los Angeles, Honolulu

*Export Distributors*—United States Steel Products Co., 30 Church St., New York, N. Y.

Rule D, Group 2—Costs—It is the judgment of the industry that each member should install a proper and accurate method for determining his cost.

Rule E, Group 2—Trade Practice Committee—A Committee on Trade Practices is hereby created to co-operate with the Federal Trade Commission and to perform such acts as may be proper to put these rules into effect.

Rule F, Group 2—Fictitious Bills of Lading—The presentation or use of fictitious bills of lading or other evidence of billing, for the purpose of securing advances of money or other valuable consideration, is condemned by the industry.

### Security Owners Defend Rate Rise as Against Wage Cut

Declaring that up to the present time "labor has borne a heavy share of the burden" and calling attention to the delay and the threat to the morale of railroad workers which would attend a wage reduction movement, the National Association of Owners of Railroad and Public Utility Securities has issued a statement designed to show that "it is clear why the carriers have pinned their salvation upon a restoration of revenues to meet the present emergency rather than a reduction in wages."

The statement is in the main a detailed discussion of the present condition of railroad labor. In opening it calls attention to the fact that "In the set-up of railroad costs the most flexible item is labor and it is upon this item that management must bear most heavily when the protection of credit demands that expenses be cut."

Statistics quoted show that management has been forced to adopt such a course for they reveal that 350,000 men have been furloughed while approximately 40 per cent of the remaining 1,330,000 are on part-time. Furthermore, almost half the qualified conductors and 50 per cent of the qualified engineers have been reduced respectively to brakemen and firemen—a condition dictated by the inadequacy of revenues which has "brought destitution to the families of hundreds of thousands of men and discouragement to many more." If revenues are not restored, the statement continues, more lay-offs must come and, under such circumstances, "It is a serious question how long the morale of workers can be maintained."

But even without entering into a discussion of the economic feasibility of wage reductions the statement points out that such a course would be ineffective in the present emergency. The steps required in proceeding to adjust railway wages under existing Federal law are listed to substantiate the observation that "negotiations of this character consume much time and it is possible for years to pass before the question is finally decided." Also, "the attitude of the Administration has been and continues to be opposed to wage cuts and any move on the part of the carriers would be weighed carefully with no certainty of ultimate saving from this source."

In closing, attention is called to the fact that "The railroads have indicated that a portion of the relief granted to them will be passed on to labor in the form of increased employment, thus maintaining the morale of the workers and easing tension which has developed in the solidly organized ranks of railroad labor."

# Foreign

### British Peer Urges Curtailing Highway Construction

The Marquess of Exeter, writing in the Times (London) proposing price fixing to stimulate agricultural production in Great Britain, says: "I am aware that all this will cost money, but how much better would it be for all if the enormous sums spent each year in 'grandiose' road schemes were employed in the production of food? We have the most efficient railway system in the world; let it once more take its place in the transport service of the country rather than build up a competing system at the expense of the taxpayer."

### Bus Lines of British Railways Report Traffic Increase

A decline in railway passenger business on railways of Great Britain was accompanied during 1930 by material increases in the traffic and revenue from highway services operated by these roads, according to information recently received from London by the United States Department of Commerce.

The number of bus passengers during the past year totalled 17,725,212, as against 11,736,744 in 1929, and the motor truck traffic more than doubled, increasing from 205,610 tons to 431,531. The vehicle miles covered by the buses totalled 6,828,379, as compared with 5,947,881 in 1929, and the truck mileage was 1,778,942 as against 988,886. The receipts from the highway passenger services of the railways increased from £189,894 in 1929 to £288,277 in 1930, and those from the highway freight services from £60,642 to £113,918.

The number of buses owned by the railways of Great Britain at the end of December 1930, totalled 211 against 239 in 1929, and the motor trucks owned totalled 133 as against 78 at the end of 1929.

### Sees Need for Authority to Force Proper Co-ordination

Proper co-ordination of transport will come only when somebody is created with authority to decide how and to what extent each agency of transportation is to function, according to the view of Herbert Morrison, British minister of transport. Such a body, Mr. Morrison added, should also have authority to require from each agency "a standard of efficiency as the price of being allowed to function."

The Minister expressed this view in speaking on the general transport situation at a recent luncheon in London. The major problem confronting the ministry, he said, is the whole question of the future of the British railways. The attitude of the government toward the report of the Weir Committee on Railway Electrification, he revealed, has not been decided. (This report, discussing without definite recommendation the potentialities and estimated cost of complete electrification of British railways, was reviewed in the *Railway Age* of May 30, page 1059.) Mr. Morrison did not, however, think that the railways could accomplish the electrification unless they were sure that it would bring adequate traffic or that they would be protected against undue highway competition.

# Equipment and Supplies

## FREIGHT CARS

The United States Navy Department is inquiring for one flat car of 50 tons' capacity for service at the Philadelphia yard.

The Litchfield & Madison has ordered four steel underframe caboose cars 30 ft. long, from the American Car & Foundry Company.

The New York Central has ordered 500 gondola cars of 70 tons' capacity; 300 of these will be built in the railroad shops at Avis and 200 will be built in the shops of the Merchants Despatch Transportation Company. In the *Railway Age* of August 15 it was reported that this company contemplated building from 200 to 300 gondola cars in its own shops.

## PASSENGER CARS

The Board of Transportation, City of New York, will advertise in a few days for prices on 300 to 1,500 steel passenger cars for subway service. In the *Railway Age* of May 9, it was reported that the Board was preparing contracts for the purchase of this equipment.

## MOTOR COACHES

The Central of New Jersey has accepted delivery of two Mack model BK, 40-passenger interstate type motor coaches.

The Reading Transportation Company has accepted delivery of one Mack, model BK, 40-passenger interstate type motor coach.

## IRON & STEEL

The Lehigh Valley has ordered 150 tons of steel for a bridge in New Jersey from the McClintic-Marshall Corporation.

The Wabash has ordered 100 tons of structural steel for alterations to its Clark Street freight house, Chicago, from the Sprague Iron Works.

The New Orleans Public Belt is inquiring for 58,700 tons of structural steel for a bridge across the Mississippi river at New Orleans, La.

The Pennsylvania has ordered 110 tons of steel for a bridge at Crafton, Pa., and 200 tons for a bridge at Lancaster, Pa. from the American Bridge Company. An order for 500 tons of steel to

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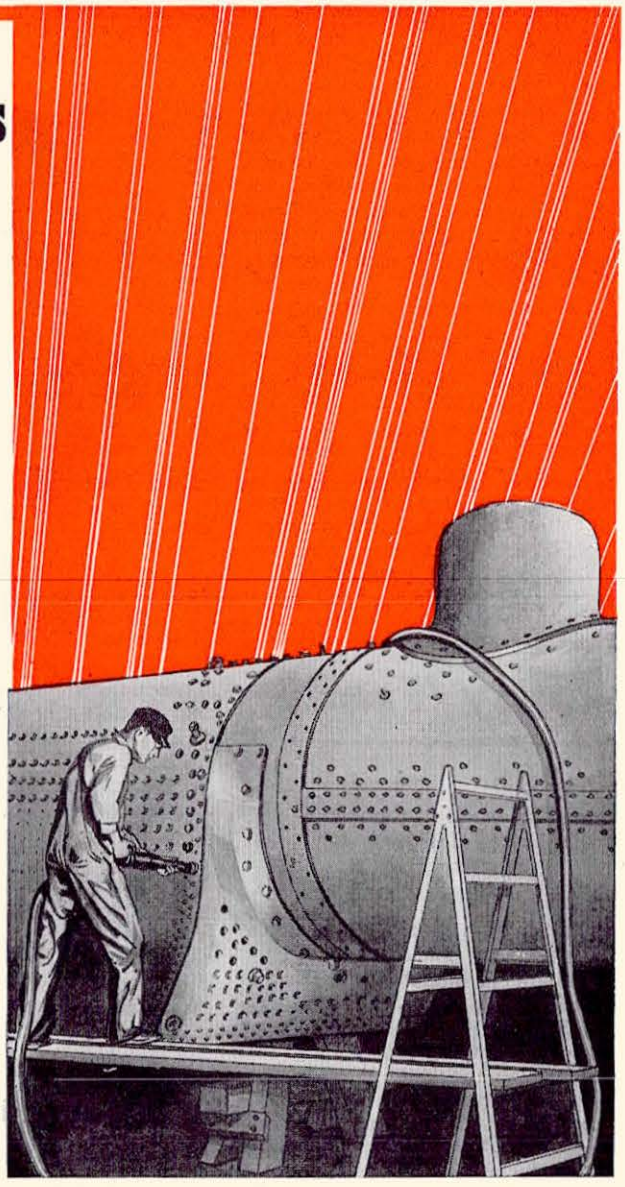
# Down go STAYBOLT renewals



In 1926, a mid-west railroad was averaging 402.6 miles per staybolt renewal. At this time, they began extensive use of Republic alloy staybolts.

In 1929, performance had improved so that 648.7 miles were being made per renewal. For 1930 the mileage was well over 800.

This record of Republic staybolts is only one of numerous instances where maintenance is being held in check by the use of modern materials for replacement purposes.

Great progress has been made by Republic metallurgists in perfecting special alloy steels and irons for specific railroad requirements. Use them where parts are now giving trouble, and specify them for new equipment.

CENTRAL ALLOY DIVISION
**REPUBLIC STEEL**
CORPORATION
Massillon, Ohio

REG. U. S. PAT. OFF.
TONCAN
COPPER
Mo-lyb-den-um
IRON

ACATHON STEELS
TRADE MARK

be used on Pennsylvania station in New York has been given to the Fort Pitt Bridge Works.

## MISCELLANEOUS

THE TIMKEN ROLLER BEARING COMPANY, Canton, Ohio, has been given an order for the bearings on 150 of the new electric locomotives to be built by the Pennsylvania Railroad for service between New York and Washington, D. C. The order includes taper roller bearings for all of the trucks and the driver wheels; 90 of these locomotives are for passenger service and 60 for freight service. The passenger locomotives are designed for a speed of 90 miles an hour. The Timken Company, about two years ago, built a steam locomotive equipped throughout with Timken bearings, including the main journals. This locomotive has been tested for a year and a half on 11 railroads, including many eastern roads and is now under test on western railroads. It has already gone over 75,000 miles and has been handled by over 500 different train crews with satisfactory results. Timken bearings at present are used on over 236 locomotives, either on leading trucks, trailer trucks or tenders. In addition, they have been used on several thousand passenger cars, Pullmans and freight cars.

# Supply Trade

**R. E. Walker,** representative of the **American Rolling Mill Company,** with headquarters at Middletown, Ohio, has been placed in charge of the office at Tulsa, Okla.

**The Worthington Pump & Machinery Corporation,** New York, has acquired the manufacturing and marketing facilities of **Metalweld, Inc.,** Philadelphia, Pa., builders of portable compressor units. For many years Worthington has been engaged in the compressor industry, and last year took over the manufacture and sale of Gilman rock drills and accessories. Worthington is now in a position to supply the air equipment requirements of railroads and industrial users. The portable compressors will be manufactured at the Harrison, N. J. works of the Worthington Pump & Machinery Corporation, and the engineering, manufacturing and sales personnel of the Metalweld organization also will be located there.

## OBITUARY

**A. R. Wilson,** sales engineer of the Hutchins Car Roofing Company, Detroit, Mich., died in that city on August 15.

**Carleton M. Bower,** vice-president of the Southern Wheel Company, with headquarters at New York, died on August 10, in the Presbyterian Hospital, New York, after an illness of several months. Mr. Bower was born at Clarkston, Mich., on July 8, 1880, and received his education at the Ferris Institute, Big Rapids, Mich. In 1899 he became stenographer in the yard office of the Grand Trunk at Detroit, and the next year stenographer to the vice-president of the Pere Marquette. In 1902 he was claims clerk in the superintendent's office of the Grand Trunk. In 1903, he became road clerk in the accounting department of the New York Central at New York. He was appointed statistician to the vice-president of the New York Central Lines at Chicago in 1907 and continued in that capacity until 1909 when he became manager of the National Materials Company, at New York. In 1911 he became eastern sales agent of the Hewett Rubber Company at New York City and remained in that position until 1923 when he was elected vice-president of the National Car Wheel Company. When this latter company was absorbed by the Southern Wheel Company in 1925, Mr. Bower was elected vice-president and director of the Southern Wheel Company, remaining in that position until the time of his death.

Carleton M. Bower

## TRADE PUBLICATIONS

T-TRI-LOCK—The Carnegie Steel Company, Pittsburgh, Pa., has issued a 24-page pamphlet containing an exposition of a new form of highway bridge floor known as T-Tri-Lock, consisting of a grille of interlocked tees and bars. In addition to an illustrated description, the booklet contains detailed structural data on the physical properties necessary for the rational design of floors with this new product.

DESIGNING PIPE LINES FOR PRESSURE—In Bulletin No. 3, Vol. 1, the American Rolling Mill Company, Middletown, Ohio, presents a chart for determining the wall thicknesses of pipes for various diameters and hydrostatic pressures, based on a working stress of 10,000 lb. per sq. in. The text matter explains the use of the chart and points to the economy possible through the wide range of wall thicknesses available in Armco spiral welded pipe.

# Construction

ATCHISON, TOPEKA & SANTA FE.—The T. A. Allen Construction Company, Los Angeles, Cal., has been awarded a contract for work in connection with this road's general plan of track elevation in Oklahoma City, Okla. The contract calls for the construction of bridges over the tracks of the Chicago, Rock Island & Pacific and the St. Louis-San Francisco, underpasses carrying cross streets under the Santa Fe elevated tracks, and retaining walls to hold the earth fill.

CANADIAN NATIONAL.—Bids are now being received by this road for the steel work on the new station which it is constructing at St. John, N. B.

DELAWARE, LACKAWANNA & WESTERN.—The Public Service Commission of New York has designated for elimination the Main street crossing of this company's tracks in Cassville, N. Y.

ERIE.—Plans, specifications and an estimate of cost for the elimination of an Erie grade crossing on the Warsaw-Gainesville state highway south of Rock Glen station, Gainesville, N. Y., have been approved by the Public Service Commission of New York.

FT. WORTH & DENVER CITY.—A contract for the grading and bridge construction on this company's Childress-Pampa line in Texas, about 110 miles, has been let to Roberts Brothers, Chicago, and Hamilton & Gleason, Denver, Colo., on a joint bid.

GREAT NORTHERN.—This company contemplates the construction of terminal facilities to cost about $300,000 at Bend, Ore., which is at the northern extremity of this line's project for a connection with the Western Pacific in Northern California, now under construction.

LEHIGH VALLEY.—The Public Service Commission of New York has designated for elimination the Judd Falls road crossing of this company's tracks, one-half mile east of East Ithaca station, Ithaca, N. Y., the crossing to be eliminated by carrying the highway under the existing grade of the railroad. The commission has also approved as not excessive the low bid submitted by E. R. Ingraham, Inc., Albany, N. Y., for the elimination of the Dean crossing, Cayuta, N. Y.

MINNEAPOLIS & ST. LOUIS.—A contract has been awarded to the Stahr-Burgum Company, Minneapolis, Minn., for the construction of a warehouse, 86 ft. by 208 ft., at Minneapolis. The estimated cost of this structure is $75,000.

MISSOURI-KANSAS-TEXAS.—Bids were opened on August 18 by the City of Tulsa, Okla., for the construction of a 400-ft. reinforced concrete and steel viaduct over Third street and the M-K-T tracks in that city. The estimated cost of this work is $100,000.

NEW YORK CENTRAL.—Contracts have been awarded by this company to the

*Continued on Next Left Hand Page*

# BETTER FIRES

FIREBAR CORPORATION
CLEVELAND OHIO.

Union Iron Works of New York City and Erie, Pa., for the manufacture, delivery and erection of a water tube boiler and pulverizer in the power house at West Albany, N. Y.; to the Arthur McMullen Company, New York, for the construction of a bridge over Bronx River parkway at Woodlawn, N. Y.; to McKim, Mead & White, New York, for architectural services in connection with City Structure No. 5, New York City, and to the Walsh Construction Company, Syracuse, N. Y., for the reconstruction of bridge 594, at Bridge street, East Syracuse, N. Y. A bid received by this railroad from William M. Ballard, Inc., Syracuse, N. Y., for work covering the elimination of a grade crossing on the Mexico-Union Square state highway, Mexico, N. Y., has been approved by the New York Public Service Commission.

PENNSYLVANIA.—The Board of Public Utility Commissioners of New Jersey has ordered this company to construct a passageway for pedestrians under the southerly arch of the Hudson Boulevard bridge at Journal Square, Jersey City, N. J., so that passengers will not have to cross the highway to reach the station. The new passageway, on which work is to be started by November 1, will extend from the west side of the bridge and connect with the west end of the station concourse.

PUBLIC SERVICE COMMISSION OF NEW YORK.—This commission has added to the list of grade crossings which it is to consider for elimination during 1931, some 24 crossings located on four different railroads in the state of New York. Removal of most of these crossings will be considered in connection with proposed eliminations of nearby crossings already on the commission's list. The crossings included in the new list are as follows: On the Delaware & Hudson—Excelsior and Mansion House crossings in Saratoga Springs, Yellow House, Ingersoll, Cookingham, Barnes, Taylor, Ferry, Wicks, Baseman, County highway, Nameless, Lansing, Careys and River road crossings in the towns of Wilton, Northumberland and Moreau, and Gansevoort-Butlers road and Fullerton street crossings in Northumberland, N. Y.; on the Erie—Seamanville, Maple avenue and Brooks crossings in Monroe and Howells Center and Howells Lower crossings in Wallkill, N. Y., and on the New York, New Haven & Hartford and the Lehigh & Hudson River, jointly—Campbell Hall road and Creamery road Crossings, Hamptonburgh, N. Y.

RUTLAND.—A contract amounting to $28,000 has been awarded to M. J. Burrington, Jr., Bennington, Vt., for the construction of an overpass to eliminate a grade crossing at South Shaftsbury, Vt., while bids have been received for the reconstruction of an underpass on state highway 5468, 1.5 miles east of Chateaugay, N. Y. The lowest bid submitted for this work, amounting to $36,499, was received from Lord & Humphrey, Malone, N. Y.

ST. LOUIS-SAN FRANCISCO.—A contract has been awarded to R. J. Reed, Birmingham, Ala., for the construction of a reinforced concrete and steel subway under this company's four-track line over Southwest avenue at Ivanhoe avenue, St. Louis, Mo., at a cost of about $85,000.

ST. LOUIS-SAN FRANCISCO.—Plans have been prepared for the construction of an overpass over this company's tracks at Quanah avenue and Twenty-Third street, West Tulsa, Okla. This structure, which will be of reinforced concrete construction, will be 160 ft. long and 40 ft. wide, and will have two five-foot side walks. The estimated cost of the project is $80,000.

SOUTHERN PACIFIC.—This road, the Missouri Pacific, the Missouri-Kansas-Texas and the city of San Antonio, Tex., contemplate the elimination of 16 grade crossings in the business district of that city, at a cost of about $700,000.

# Financial

BALTIMORE & OHIO.—*Asks Authority to Operate B. R. & P.*—This company has applied to the Interstate Commerce Commission for authority to operate as its own the property of the Buffalo, Rochester & Pittsburgh, of which it owns 99.11 per cent of the capital stock, under an operating agreement, including the properties of the Buffalo & Susquehanna.

CHESAPEAKE & OHIO.—*Abandonment.*—The Interstate Commerce Commission has authorized this company to abandon the branch line extending from Mount Sterling, Ky., southeasterly to Rothwell, 19.5 miles.

CHICAGO, BURLINGTON & QUINCY-CHICAGO, ROCK ISLAND & PACIFIC.—*Trackage Rights, Construction and Abandonment.*—These companies have filed with the Interstate Commerce Commission a joint application for authority for the Burlington to operate over the Rock Island tracks between Beatrice, Neb., and Rockford, and for both companies to construct connecting tracks. The Burlington has also asked authority to abandon its own line between those points.

CHICAGO, ROCK ISLAND & PACIFIC.—*Trackage Rights.*—The Interstate Commerce Commission has authorized this company to abandon the use of the freight and passenger terminal facilities of the New Orleans, Texas & Mexico in Eunice, La., and, instead, to utilize, under trackage rights, the terminal facilities of the Texas & New Orleans. The change will require the construction by the Rock Island of a connecting line 0.6 miles long at a cost of $12,603.

LOUISIANA, ARKANSAS & TEXAS.—*Trackage Rights.*—This company has applied to the Interstate Commerce Commission for authority to operate under trackage rights over the line of the Missouri-Kansas-Texas of Texas between Greenville, Tex., and Dallas.

LOUISVILLE & NASHVILLE.—*Bonds.*—The Interstate Commerce Commission has authorized this company to procure the authentication and delivery of $8,881,000 of first and refunding mortgage 4½ per cent, series C, bonds in partial reimbursement of capital expenditures and for retiring or purchasing certain underlying bonds.

MIDDLE FORK.—*Acquisition.*—The Interstate Commerce Commission has authorized this company to acquire and operate a line extending from Midvale, W. Va., southerly to a point near Cassity, 13 miles.

PENNSYLVANIA.—*Bonds.*—The Interstate Commerce Commission has authorized the Philadelphia, Baltimore & Washington to issue $5,800,000 of general mortgage, Series D, 4½ per cent bonds to be delivered to the Pennsylvania in partial reimbursement for capital expenditures, the latter company to assume obligation as lessee for the bonds.

SEABOARD AIR LINE.—*Bondholders' Committee.*—A protective committee has been formed by a group of bankers in Baltimore who, according to their statement, represent more than 20 per cent of the underlying bonds of the Seaboard Air Line. The committee states that on January 15, 1931, the federal court in Virginia ordered that the bondholders of the road receive first consideration. Since that time, however, another federal judge authorized the issuance of $8,000,000 of receivers' certificates. Pursuant of this authority, the Interstate Commerce Commission approved the sale of $4,000,000 of 5 per cent receivers' certificates, due on May 1, 1932, to Dillon, Read & Co., and Ladenburg, Thalmann & Co. at 93¾. The committee seeks the deposit of the following bonds: Seaboard & Roanoke first mortgage, Raleigh & Gaston first mortgage, Raleigh & Augusta Air Line first mortgage, Carolina Central first consolidated mortgage, Georgia, Carolina & Northern first mortgage, Atlanta-Birmingham first mortgage, South-Bound first mortgage, Georgia & Alabama Terminal bonds, Georgia & Alabama first mortgage consolidated, Florida Central & Peninsular first consolidated mortgage, and Florida West Shore first mortgage. The depositories are the Safe Deposit and Trust Company and the Mercantile Trust Company, both of Baltimore.

SUSQUEHANNA & NEW YORK.—*Debentures.*—The Interstate Commerce Commission has authorized this company to issue $724,000 of 10-year 5 per cent debentures upon surrender of an equal amount of first mortgage 5 per cent bonds.

TENNESSEE CENTRAL.—*Bonds.*—The Interstate Commerce Commission has authorized this company to issue $400,000 of 6 per cent, first mortgage, series A, bonds in partial reimbursement for capital expenditures, to be pledged and repledged as collateral security for short term notes.

TEXAS & NEW ORLEANS.—*Abandonment.*

*Continued on Next Left Hand Page*

# For Replacing *local passenger trains* . .

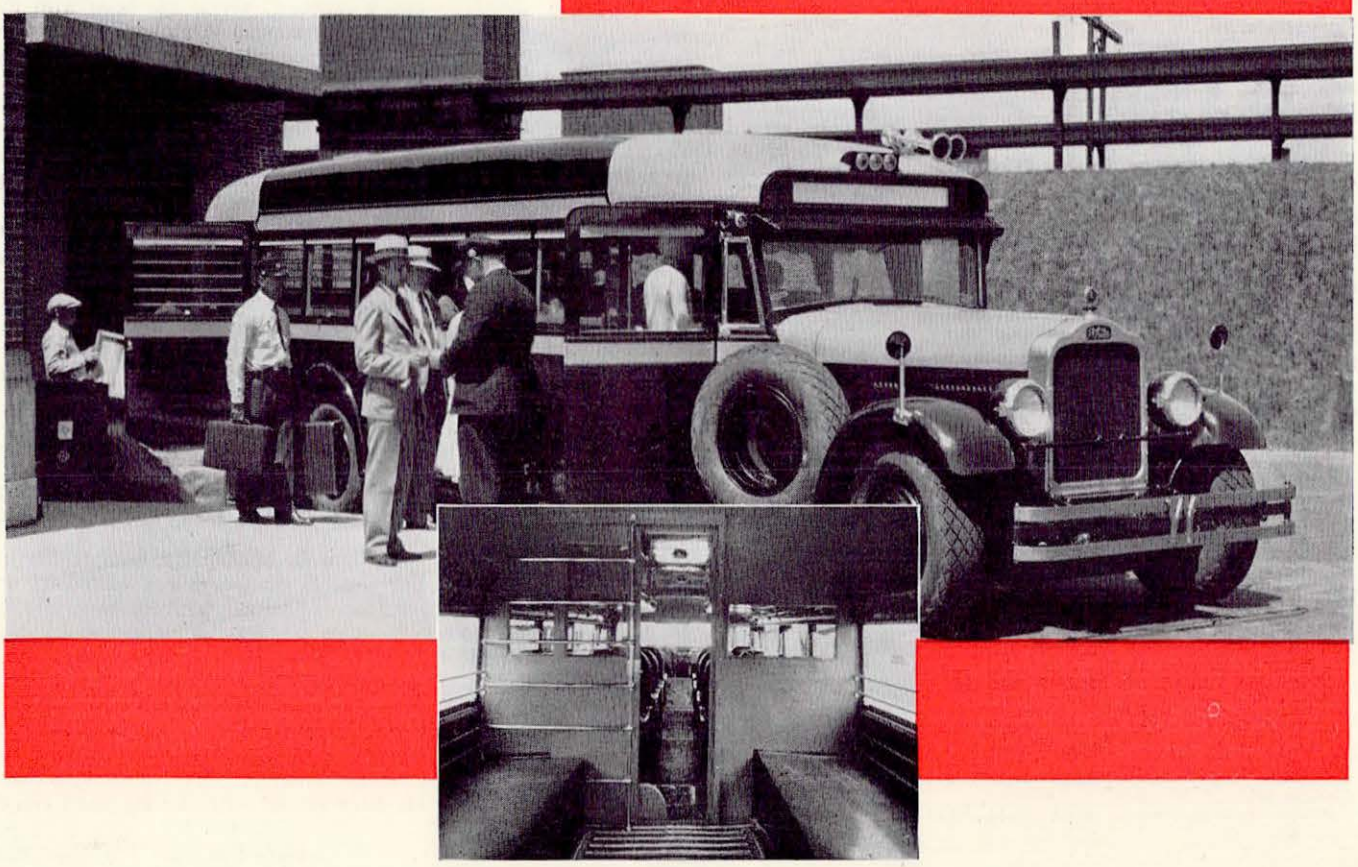
THE White Combination Passenger and Express Coach, specially designed for railroad use, is a dependable and economical transportation unit for replacing local passenger trains and for feeder service.

The Combination Coach seats 16 passengers, with additional emergency seats to care for overflow loads. The rear cargo compartment for the carrying of mail, baggage and express contains about 350 cubic feet of space. Sizes of passenger and express compartments may be varied to fit the particular needs of the operator. White Combination Coaches are furnished in a variety of wheelbases.

White Coach equipment is used extensively by leading railroads throughout the United States. White service facilities are available everywhere and at reasonable cost.

Before you purchase additional equipment it will pay you to investigate what White has to offer. The White Company, Cleveland.

## WHITE COACHES



—This company has applied to the Interstate Commerce Commission for authority to abandon its line from West Port Arthur, Tex., to Sabine, 12.21 miles.

ULSTER & DELAWARE.—*Receivership.*—This company, the commercial value of which was placed last June by the Interstate Commerce Commission at $2,500,000 to be paid by the New York Central in acquiring control of the property, has been placed in receivership. The receiver is Harry H. Fleming, Kingston, N. Y., general counsel for the railroad. The railroad, it was stated in the receivership petition, has the following bonded indebtedness: $2,000,000 of first consolidated mortgage 5 per cent bonds, which became due on June 1, 1928, and $1,000,000 of first refunding gold mortgage 4 per cent fifty-year bonds maturing October 1, 1952. Bondholders' protective committees have been functioning for some time. The chairman of the committee representing the 4 per cent fifty-year mortgage bonds, said that 75 per cent of the bonds had been deposited and that the time limit for deposit had been set for September 10. More than 88 per cent of the first consolidated mortgage 5% bonds have been deposited.

When the Interstate Commerce Commission authorized the New York Central to merge the Big Four and Michigan Central, it stipulated that the trunk line should care for short lines in the territory.

After arbitration, the New York Central agreed to pay $2,500,000 for the Ulster & Delaware. Recently it was decided that $2,000,000 of 5 per cent bonds should receive 76 per cent of this price and that the balance of 24 per cent should go to $1,000,000 of 4 per cent bonds. Deposits of these bonds were made on this understanding.

WASHINGTON TERMINAL.—*Final Valuation.*—The Interstate Commerce Commission has issued a final valuation report as of 1915, finding the final value for rate-making purposes to be $15,050,000. This includes $3,000,000 which had been deducted in the tentative valuation report as representing a contribution by the United States government toward the construction of the terminal, at Washington, D. C., but which the final report finds to have been paid to the Baltimore & Ohio and the Philadelphia, Baltimore & Washington for the surrender of certain rights and for the elimination of grade crossings.

## Dividends Declared

Missouri Pacific.—Preferred, 1¼ per cent, quarterly, payable October 1 to holders of record September 14.

Texas and Pacific.—Common and Preferred, 1¼ per cent, quarterly, both payable September 30 to holders of record September 14.

Union Pacific.—Common, 2½ per cent, quarterly; Preferred, 2 per cent, both payable October 1 to holders of record September 1.

## Average Prices of Stocks and of Bonds

| | Aug. 18 | Last week | Last year |
|---|---|---|---|
| Average price of 20 representative railway stocks. | 60.70 | 61.58 | 113.11 |
| Average price of 20 representative railway bonds.. | 87.05 | 88.33 | 94.91 |

# Railway Officers

## EXECUTIVE

**George C. Manning,** freight tragic manager of the Erie, has been appointed assistant vice-president, with supervision over the traffic department in New York and eastern territory. He will have headquarters, as before, at New York. Mr. Manning was born at Lockport, N. Y., on September 3, 1874, and received a public school education. He entered railroad service in 1899, as clerk in the freight office of the Erie at Lockport, N. Y., serving in that capacity and in various clerical positions in that city and in Tonawanda, N. Y., until 1903. In the

George C. Manning

latter year he was appointed agent at Lockport, and in 1904 traveling freight agent at Buffalo, N. Y. From 1907 to 1909, he served in the same capacity at New York. In 1909, he was appointed division freight agent serving on several divisions, consecutively, and in 1916 was appointed general agent at Youngstown, Ohio. In 1918, he was appointed assistant general freight agent, lines west, and in the following year general freight agent at Chicago. From 1920 to 1925, he served as general freight and passenger agent at Youngstown, and in 1925, he was named freight traffic manager, the position he held until his recent appointment.

**George D. Ogden,** assistant vice-president (traffic) of the Pennsylvania, at New York, has been appointed traffic vice-president for New England, a newly created position, with headquarters at Boston. Mr. Ogden was born at Homer City, Pa., on May 16, 1868. He received his education at the Indiana Normal School and Washington and Jefferson College, Washington, Pa., entering railway service in June, 1887, as freight and ticket agent on the Pennsylvania at Homer, Pa. From 1890 to 1901 he served successively as night yard clerk at Allegheny City, Pa.; transportation clerk in the superintendent's office, West Penn division; freight and ticket agent at Butler, Pa.; freight agent and yard master at McKeesport, Pa., and freight agent at Harrisburg, Pa. In 1901, Mr. Ogden was appointed division freight agent at Altoona, Pa., and from 1903 to 1906 he served in a similar capacity on the Buffalo & Allegheny Valley division at Pittsburgh. He was promoted to assistant general freight agent at Philadel-

George D. Ogden

phia on March 1, 1906, serving in that position until May, 1912, when he was further advanced to general freight agent. Mr. Ogden was appointed freight traffic manager, lines east of Pittsburgh, in May, 1916, and in March, 1920, he became traffic manager. In July, 1929, he was promoted to assistant vice-president in charge of traffic at New York. His entire railroad service has been with the Pennsylvania. In October, 1917, Mr. Ogden organized the Traffic Emergency Committee to devise methods for avoiding congestion of war materials. In December of the same year, at the request of the General Operating Committee, Eastern Railroads, Railroads' War Board, he organized the Export Division of that committee, and when the name was changed to the Freight Traffic Committee, North Atlantic Ports, during federal control, he continued as chairman until June, 1918. On the latter date, upon the creation of the Exports Control Committee, Mr. Ogden was chosen chairman of that committee.

## FINANCIAL, LEGAL AND ACCOUNTING

**William B. McKinstry,** comptroller of the Central of Georgia a subsidiary of the Illinois Central, with headquarters at Savannah, Ga., has been appointed to the same position on the latter road, with headquarters at Chicago, to fill a position that has been vacant for several years. Mr. McKinstry entered railway service with the Michigan Central at Chicago when he was 16 years of age. He later served with the Illinois Central

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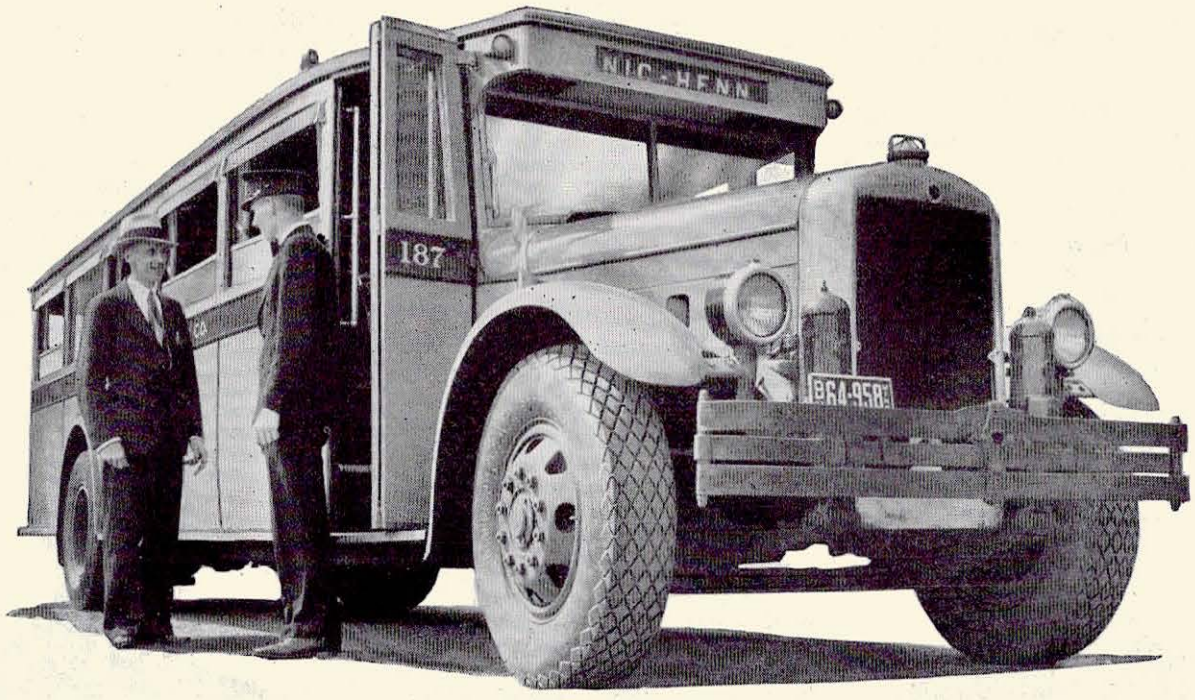


# 12 YEARS IN THE TWIN CITIES

For 12 years Goodyear Tires have been on the wheels of passenger coaches operated in Minneapolis and St. Paul by the Twin City Motor Bus Co.

For 7 years, no tires except Goodyears have been used.

It is a record of service so satisfactory that it has grown through the years—tire mileages highly satisfactory—road delays seldom known.

Such performance as this is the reason for Goodyear's outstanding position today in the tire industry—such experiences as this explain why more people ride on Goodyear Tires than on any other kind.

Why shouldn't you use THE leading make of tire?

THE GREATEST NAME IN RUBBER

**GOODYEAR**

**ON YOUR NEW COACHES SPECIFY GOODYEARS**

at the same point in the agent's office and then in the freight claim office. In May, 1903, he went to the Central of Georgia as a claim investigator in the freight claim department at Savannah, and was promoted to traveling auditor in 1905. Two years later Mr. McKinstry was promoted to freight claim agent, and in 1915 he was appointed auditor, which position he held until his appointment as comptroller in 1917. During the World War he served as federal auditor of the Central of Georgia and of the Ocean Steamship Company, also a subsidiary of the Illinois Central, being reappointed comptroller of these companies after the war. His appointment as comptroller of the Illinois Central becomes effective on September 1. Mr. McKinstry is also first vice-president of the Railway Accounting Officers' Association.

William B. McKinstry

## OPERATING

**N. H. Buck,** acting trainmaster on the Middle division of the Atchison, Topeka & Santa Fe, has been appointed trainmaster, with headquarters as before at Newton, Kan.

The positions of superintendent of the Eastern, Black Hills and Wyoming divisions of the Chicago & North Western, which comprise the Lines West of this road, have been abolished and in effect these divisions have been combined into one division, under the jurisdiction of **H. E. Dickinson**, general superintendent, Lines West, at Omaha, Neb., and **M. E. Pangle,** assistant general superintendent, at Norfolk, Neb. **W. F. Carroll**, superintendent of the Wyoming division, has been appointed assistant superintendent, with headquarters as before at Casper, Wyo. **S. S. Long,** superintendent of the Black Hills division, with headquarters at Chadron, Neb., has been appointed assistant superintendent on both the Madison and Dakota divisions, with headquarters at Winona, Minn. The territory comprising the Minnesota division has recently been divided between the Madison and Dakota division, that portion of this territory east of Waseca, Minn., going to the Madison division and that portion west of Waseca going to the Dakota division. **M. J. Boyle,** superintendent of the Minnesota division, with headquarters at Winona, Minn., has been transferred to the Northern Iowa division, where he succeeds **G. E. Bonner,** who has retired.

## TRAFFIC

**F. J. Conrad** has been appointed foreign freight agent for the Western Pacific, at San Francisco, Cal., to succeed **T. E. Noel,** deceased.

**Ivan C. Kuhns**, commercial freight agent of the Western Maryland at Kansas City, Mo., has been appointed general agent at Philadelphia, Pa., succeeding **G. J. Davis,** deceased.

**William H. Stadelman**, assistant freight traffic manager of the Erie, has been appointed eastern freight traffic manager at New York. **Robert E. O'Grady,** perishable freight agent, has been advanced to manager of perishable freight, with office at New York. **L. B. Burford,** assistant freight traffic manager at New York, has been appointed freight traffic manager at Cleveland. **V. M. Wellman** has been appointed industrial agent at New York, in addition to his present duties as assistant general land and tax agent. **T. E. McAndrews,** assistant general freight agent at Chicago, has been appointed to a similar position at Pittsburgh, Pa., succeeding **L. R. Knapp,** who has been appointed assistant freight traffic manager at Cleveland. **B. F. Conway,** general agent at Albany, N Y., has been transferred to Buffalo, N. Y., to take over the duties of division freight agent, and **G. W. Madsen** perishable freight agent at Boston, Mass., has been appointed general agent at Albany. **C. D. Turner** has been appointed general agent at Chicago, and **D. R. Thompson**, general agent at Minneapolis, Minn.

**W. L. Huggins, Jr.,** director of publicity of the St. Louis-San Francisco, has been appointed also assistant traffic manager of the system, with headquarters as before at St. Louis, Mo. **J. G. Weaver,** division freight agent at Ft. Smith, Ark., has been promoted to traffic manager at Oklahoma City, Okla., succeeding **H. G. Snyder,** who has been appointed general agent at Springfield, Mo. **L. C. Hofman,** soliciting freight and passenger agent at St. Louis, Mo., has been appointed general agent at the same point. **Frank P. Farrel,** commercial agent, has been appointed general agent, with headquarters as before at East St. Louis, Ill., and **Clifford S. Underwood,** traveling freight and passenger agent at Wichita, Kan., has been appointed general agent at the same point. This road has established two new off-line agencies, one at Winston-Salem, N. C., and the other at Milwaukee, Wis. **E. K. Yaeger,** traveling freight and passenger agent at Chicago, has been appointed general agent at the same point, and **F. C. Ragsdale,** traveling freight and passenger agent at Atlanta, Ga., has been appointed general agent at Winston-Salem.

Mr. Huggins has been with the Frisco since 1925. He was born on June 17, 1902, at Emporia, Kan., and was educated at the Ohio Military Institute, Cincinnati, Ohio, Washburn College, Topeka, Kan., and the University of Kansas, at Lawrence. After serving for a time with the United States Navy during the World War, which he entered at the age of 16 years, Mr. Huggins became a reporter with the Topeka Daily Capitol in 1921, and during the next four years served in various capacities on this paper, the Topeka State Journal, the Wichita (Kan.) Beacon and the Kansas City Journal Post. In 1925, he took up service with the Frisco as director of publicity and editor of the Frisco Employees' Magazine, which positions he still retains, in addition to that of assistant traffic manager. His appointment to the latter position became effective on August 15.

W. L. Huggins, Jr.

## ENGINEERING AND SIGNALING

**William M. Stokes,** resident engineer of the Esquimalt & Nanaimo, has been promoted to engineer, with headquarters as before at Victoria, B. C., to succeed **Robert A. Bainbridge**, who has retired.

## MECHANICAL

**R. M. Culver,** general foreman of the Central of Georgia, has been appointed master mechanic, succeeding **S. A. Whitehurst,** deceased. His headquarters will be located at Savannah, Ga., as before.

**C. M. Heartwell,** general foreman of the Southern, has been appointed master mechanic, with headquarters as before at Lawrenceville, Va., succeeding **S. R. Kelly,** deceased. **Andrew L. Stewart,** general foreman, Danville, Ky., has been appointed shop superintendent, Spencer shops, Spencer, N. C.

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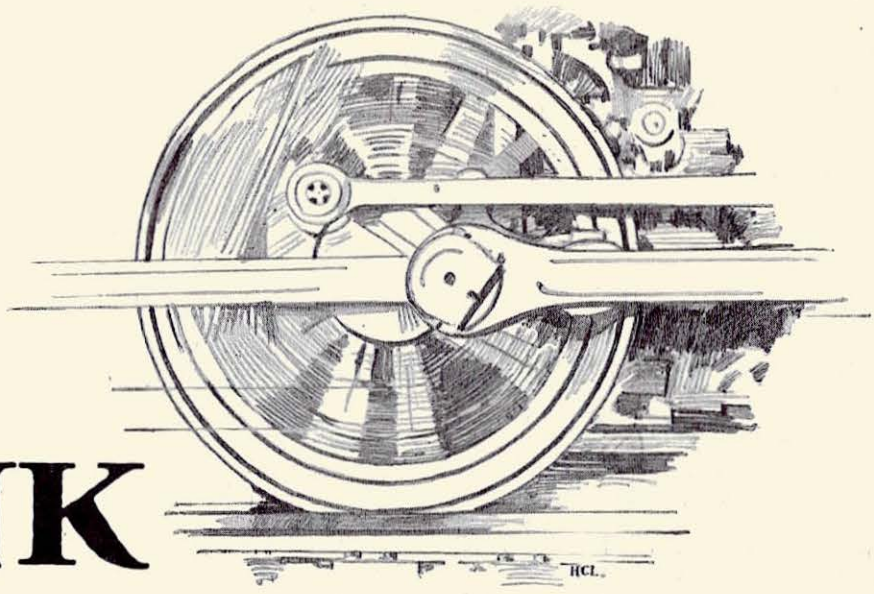

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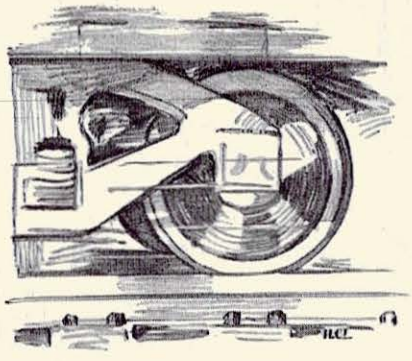
# BANG BANG



EVERY day—every minute—every time a wheel turns—destruction plays havoc with your track.

Wheels that bring you revenue also raise your maintenance costs.

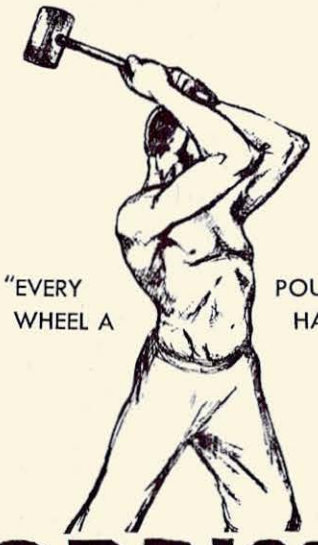
To combat the increasing cost of upkeep, Morrison offers you four unusual services—four methods of reducing costs—four plans that have been approved and are being used by some of America's greatest roads.

## CROPPING

Rails with worn and broken ends—with underhead wear from loose splice bars—are shipped to any of the strategically located Morrison plants. There they are cropped, redrilled, straightened, classified for vertical wear, tested with Sperry equipment for fissures and returned ready for use. Quantity production permits extremely low costs and rapid service.

## REBUILDING FROGS

Your old, worn frogs, manganese or carbon, are rebuilt through our special welding process for service as good as new at one-third the cost.



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## RENEWING SWITCH POINTS

Don't discard worn switch points! Morrison (patented) Renewing process returns them to you made like new, look like new, and worth as much as new in service, at one-third their original cost.

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"DEVOTED TO ECONOMIES IN TRACK MAINTENANCE"

MORRISON RAILWAY SUPPLY CORP.

## OBITUARY

**Louis F. Kemper,** general agent for the Louisville & Nashville at Cincinnati, Ohio, died at his home near that city on August 13.

**J. W. Dohany,** general counsel of the Michigan Central, with headquarters at Detroit, Mich., died of heart disease on July 30 at his home in that city.

**C. E. Wood,** superintendent of elevators of the Baltimore & Ohio, died suddenly August 13, at his home in Baltimore, Md. Mr. Wood had been in the service of the B. & O. since September, 1920, prior to which time he was connected with the Pennsylvania.

**A. R. Raymer,** assistant vice-president (operating) of the Pittsburgh & Lake Erie, with headquarters at Pittsburgh, Pa., died at his home in Beaver, Pa., on August 10, following a long illness, as

A. R. Raymer

announced in the *Railway Age* of August 15, page 272, at which time a complete sketch of Mr. Raymer's railroad career was also published. A correct reproduction of Mr. Raymer's photograph appears herewith.

**H. E. Speaks,** until recently general superintendent of the Ohio Central Lines of the New York Central, who died at Cadillac, Mich., on August 9, as announced in the *Railway Age* for August 15, was born on June 18, 1869, at Canal Winchester, Ohio. He entered railway service in 1886, as a messenger on the Columbus, Hocking Valley & Toledo (now the Hocking Valley division of the Chesapeake & Ohio), and was advanced successively through the positions of telegraph operator, timekeeper in the superintendent's office, chief clerk to the general superintendent and assistant trainmaster. In September, 1901, Mr. Speaks went with the Toledo & Ohio Central (now part of the Ohio Central lines of the N. Y. C.), as trainmaster, and in October, 1902, he was appointed superintendent on the same road. He left this road in May, 1908, to take a like position on the Hocking Valley, returning to the T. & O. C. at the end of a year as general superintendent, with headquarters at Columbus, Ohio. In March, 1920, he was promoted to general manager of the T. & O. C., the Kanawha & Michigan, the Zanesville & Western, and the Kanawha & Western Virginia, which roads now comprise the Ohio Central Lines of the N. Y. C. In March, 1923, Mr. Speaks was made general superintendent of the Ohio Central Lines, which position he held until a month ago, when he was made assistant to the general superintendent of the New York Central, with headquarters at Columbus.

**James E. Craver,** general manager of the western lines of the Northern Pacific, with headquarters at Seattle, Wash., died on August 15, of a heart attack. Mr. Craver, who had a railroad service record of 51 years, was born on July 31, 1864, at Lewisberry, Pa. He entered the service of the Chicago, Burlington & Quincy in 1880, as a night operator at West Quincy, Mo., and was later transferred to Galesburg, Ill. He went with the Northern Pacific on March 17, 1886, as an operator at Garrison, Mont., and later served in the same capacity at Billings, Mont., St. Paul, Minn., and Sprague, Wash. On December 1, 1888, he was appointed train dispatcher at the latter point and later served in this capacity and as chief dispatcher at Minneapolis, Minn. Mr. Craver was appointed trainmaster at St. Paul in 1907, and sometime later was promoted to superintendent of the North Dakota division at Fargo, N. D., being transferred to the Seattle division at Seattle in 1911. On April 24, 1920, he was appointed acting general superintendent at the same point, being in October of the same year

James E. Craver

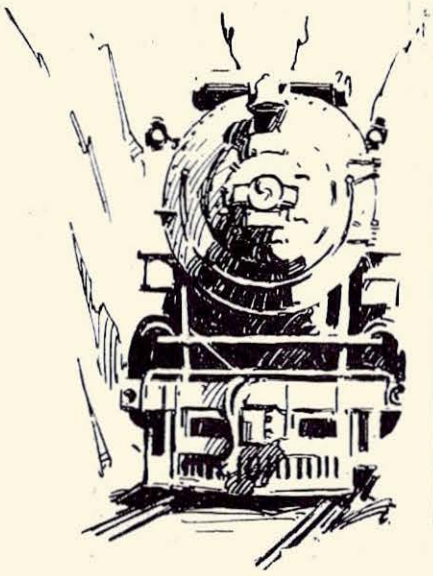
promoted to general superintendent of the Central district at Livingston, Mont. On March 8, 1924, he returned to Seattle as general superintendent of the Western district, which position he held until August 15, 1930, when he was appointed general manager at the same point. He held this position until his death.

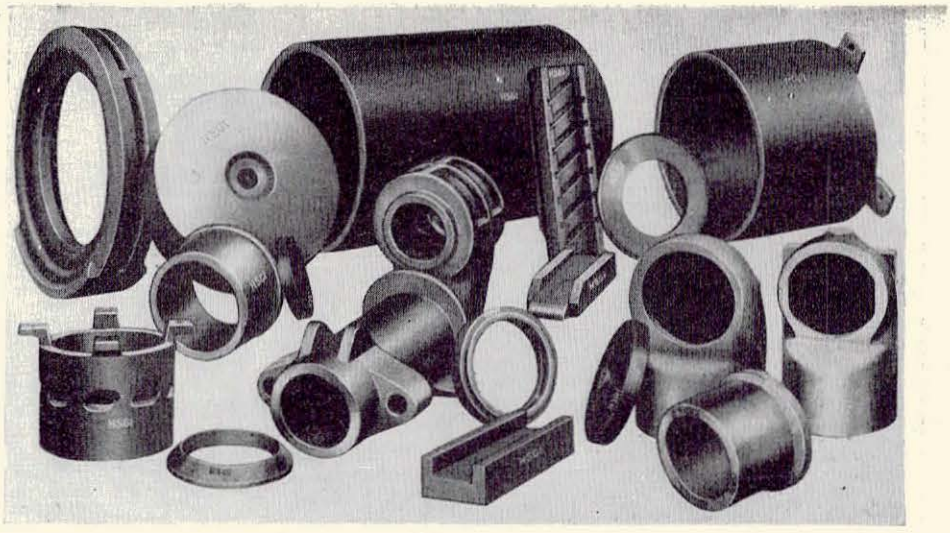
## Conrad Spens, Burlington Executive, Dies in London

Conrad E. Spens, executive vice-president of the Chicago, Burlington & Quincy, the Colorado & Southern and the Ft. Worth & Denver City, died on August 14 in London, England, at the age of 56 years, while on a trip abroad for his health. Mr. Spens, whose headquarters were at Chicago, had been associated with the Burlington for about 37 years. He was born on August 14, 1875, at Princeton, Ill., and after a high school and business college education entered the service of the Burlington on February 22, 1892, as a stenographer in the local freight office at Chicago. During the following nine years he was advanced successively through the positions of correspondence clerk in the general freight office, chief clerk to the assistant general freight agent and chief clerk to the traffic manager. Mr. Spens was promoted to assistant general freight agent at Chicago on April 1, 1903, and two years later he was further advanced to general freight agent of the Burlington lines west of the Missouri river, with headquarters at Omaha, Neb. His next promotion came on December 1, 1912, when he was named assistant freight traffic manager at Chicago, which position he held until October 1, 1917, when he was elected vice-president in charge of traffic. During federal control of the railroads, Mr. Spens served successively as director of transportation of the United States Food Administration, as assistant director of the division of traffic of the U. S. Railroad Administration, and as United States wheat director of the inland traffic department of the division of traffic of the Railroad Administration. After the war he returned to the Burlington as vice-president in

Conrad E. Spens

charge of traffic, being, on June 1, 1927, elected also to the same position on the Colorado & Southern. On January 1, 1929, Mr. Spens was elected executive vice-president of the Burlington, the C. & S. and the Ft. W. & D. C., holding these positions until his death.





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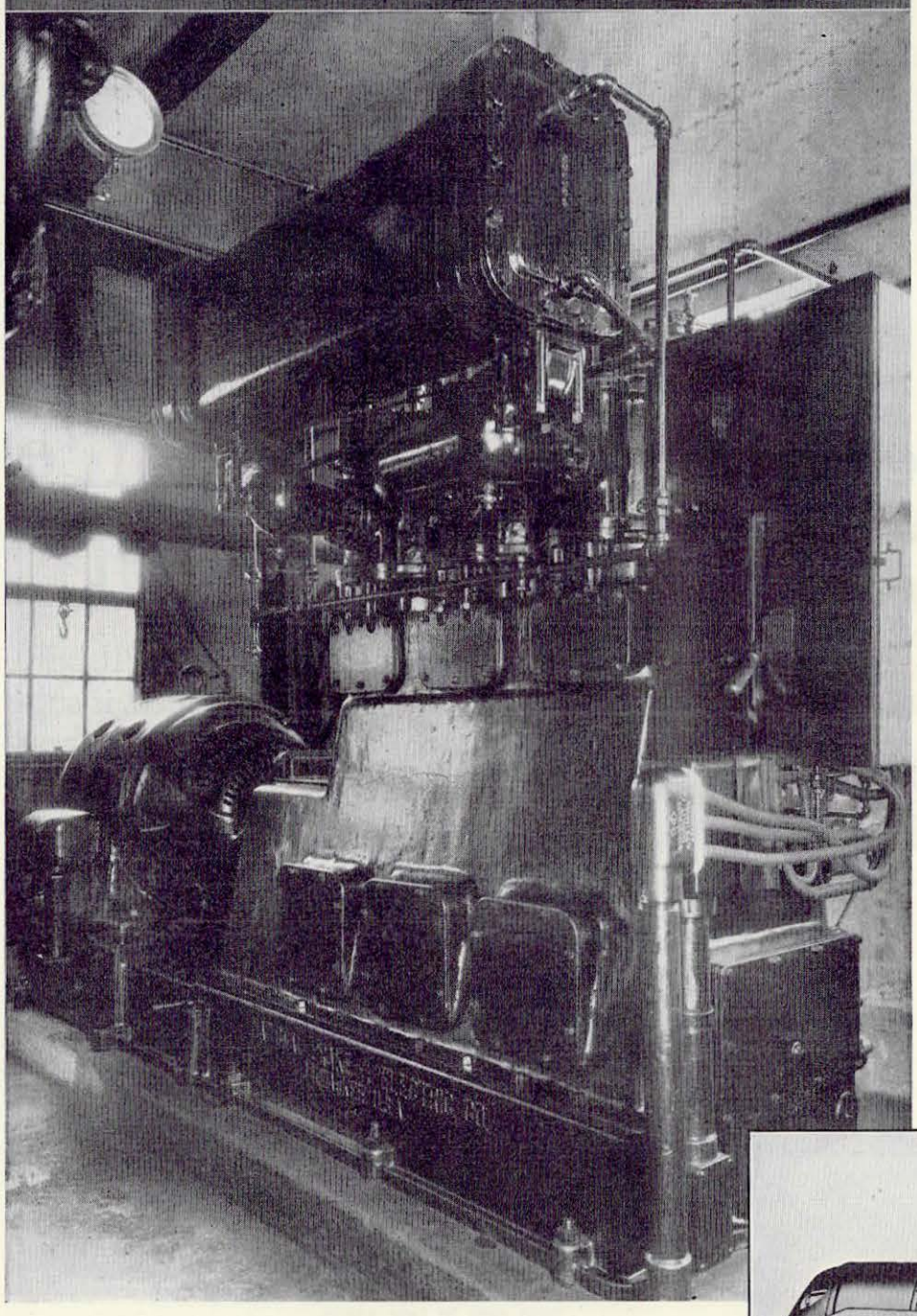

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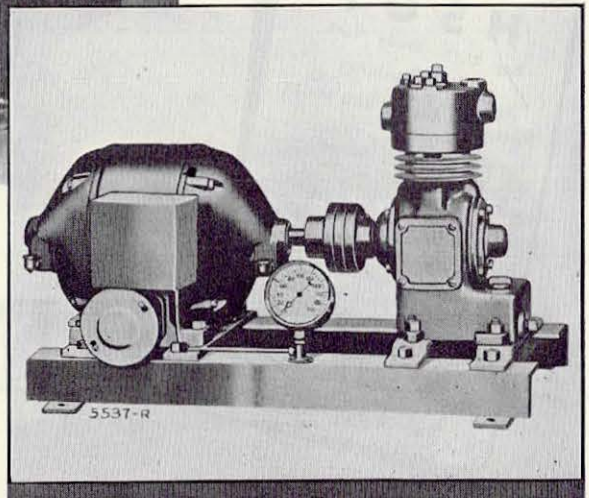


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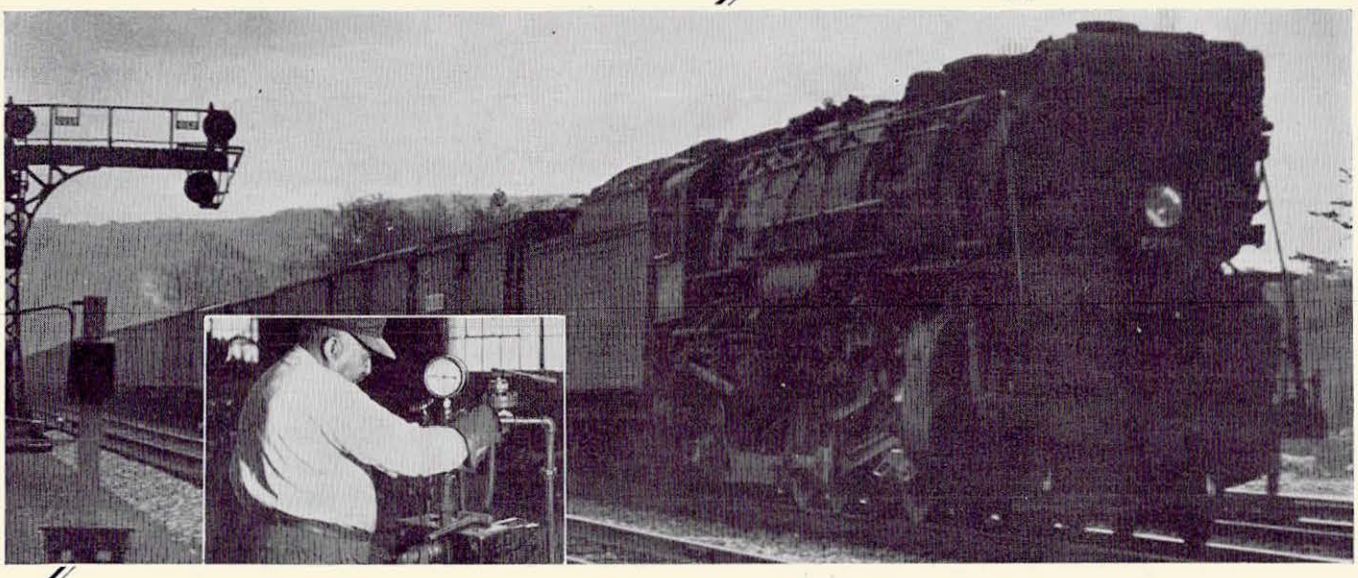

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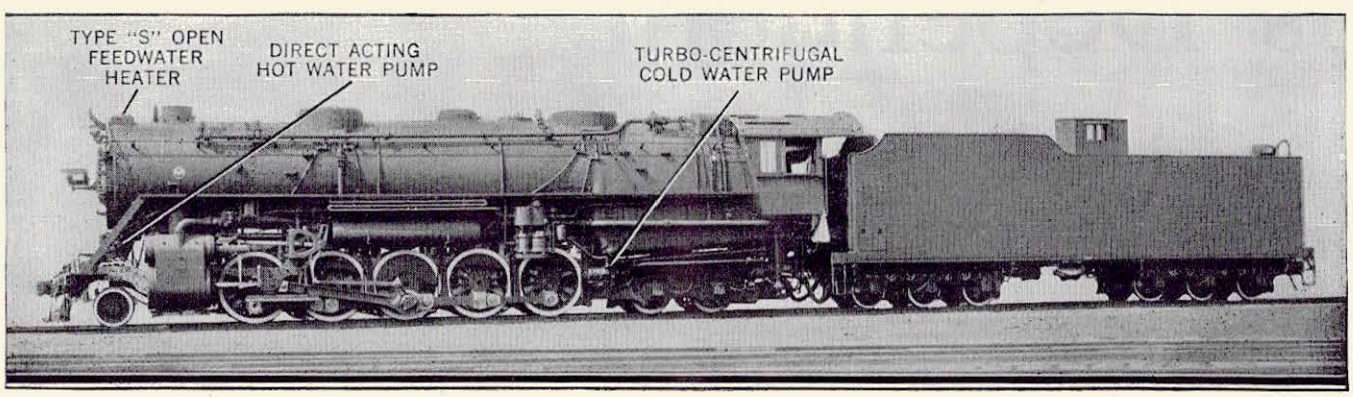
Superheaters
Superheated Steam Pyrometers
Exhaust Steam Injectors

A-632

# Paying passengers *that ride the locomotive . . .* Worthington Feedwater Heaters




SOMEBODY has to pay the freight on everything which a locomotive hauls . . . and auxiliary equipment must pay its way many times over to justify its passage.

When a prominent railroad installed a Worthington three-unit type "S" open feedwater heater in 1929, they *looked* for results. The claims made for water and fuel economy were checked by actual road tests. The reliability inherent in the design of the equipment was verified. Increased power and steaming capacity were proved.

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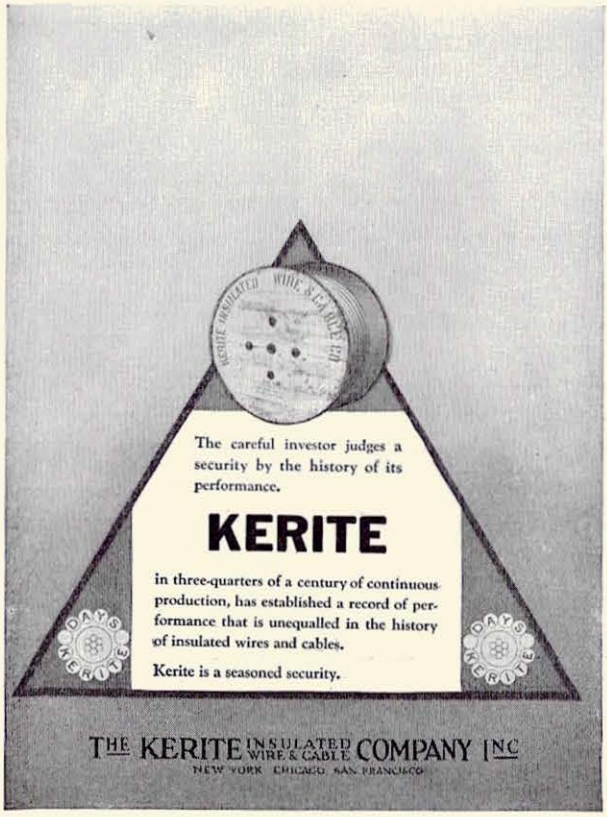
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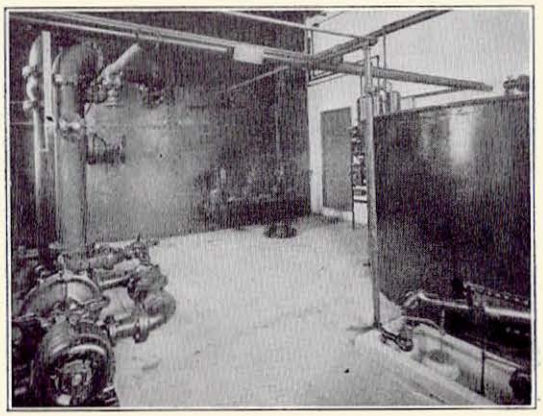

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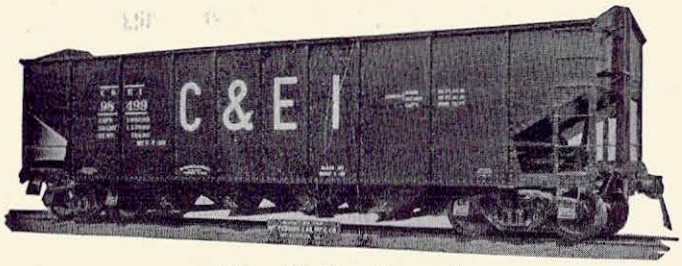


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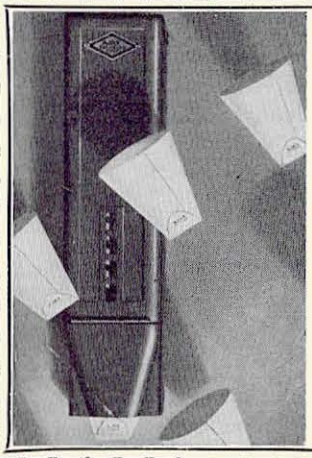

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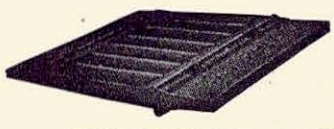

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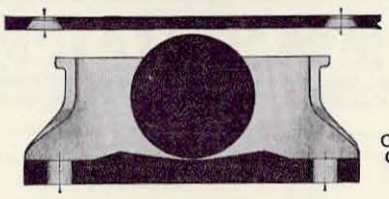

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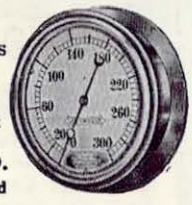

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Ryerson & Son, Inc., Jos. T.
Westinghouse Elec. & Mfg Co.

**Baggage Door Controller Device.**
Edwards Co., O. M.

**Barges, Steel.**
American Bridge Co.

**Barges, Treated.**
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
National Lumber & Creosoting Co.

**Bars, Concrete, Reinforcing.**
Carnegie Steel Co.
Central Alloy Steel Corp.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

**Bars, Iron and Steel.**
Armco Railroad Sales Co.
Carnegie Steel Co.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Illinois Steel Co.
Inland Steel Company.
Lockhart Iron & Steel Co.
McConway & Torley Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

**Bars, Rolled Steel.**
Carnegie Steel Co.

**Batteries, Lighting.**
Electric Storage Battery Co.

**Batteries, Starting.**
Electric Storage Battery Co.

**Batteries, Storage.**
Electric Storage Battery Co.
Railroad Supply Co.
Safety Car Heating & Lighting Co.

**Batteries, Wet Cell.**
Electric Storage Battery Co.

**Beams, Channel & Angle.**
Carnegie Steel Co.
Illinois Steel Co.
Ryerson & Son, Inc., Joseph T.

**Bearings, Axle Generator.**
S. K. F. Industries, Inc.
Westinghouse Elec. & Mfg. Co.

**Bearings, Ball Thrust.**
S. K. F. Industries, Inc.
Timken Roller Bearing Co., The.

**Bearings, Center.**
Brill Co., The J. G.
Chicago Railway Equipment Co.
Miner, W. H.
Pressed Steel Car Co.
Symington Co., The.

**Bearings, Journal.**
Fafnir Bearing Co.
Magnus Co., Inc.
National Bearing Metals Corp.
S. K. F. Industries, Inc.
Timken Roller Bearing Co., The.

**Bearings, Journal Roller.**
Fafnir Bearing Co.
S. K. F. Industries, Inc.
Timken Roller Bearing Co., The.

**Bearings, Roller.**
American Steel Foundries Co.
Fafnir Bearing Co.
Hyatt Roller Bearing Co.
Miner, W. H.
Shafer Bearing Corp.
S. K. F. Industries, Inc.
Standard Car Truck Co.
Stucki Co., A.
Timken Roller Bearing Co.
Wine Railway Appliance Co.

**Bearings, Roller Side.**
Q. & C. Company, The.
Standard Coupler Co.
Stucki Co., A.

**Bearings, Side.**
American Steel Foundries.
Chicago Railway Equipment Co.
Fort Pitt Malleable Iron Co.
Standard Car Truck Co.
Stucki Co., A.
Wine Railway Appliance Co.

**Beds, Cast Steel, Locomotive.**
General Steel Castings Corp.

**Bell Ringer, Locomotive.**
Ardco Mfg. Co.
Prime Mfg. Co., The.

**Bells, Highway Crossing.**
Railroad Supply Co.

**Belt Lacing Machines.**
Birdsboro Steel Foundry & Mach. Co.

**Benders, Rail.**
Q & C Co., The

**Bending and Straightening Machines.**
Ryerson & Son, Jos. T.
Sellers & Co. Inc., Wm.

**Billets, Steel.**
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
McConway & Torley Co.
Midvale Co., The.
Ryerson & Son, Jos. T.
Republic Steel Corp.
Standard Steel Works Co.

**Blocks, Chain.**
Barco Mfg. Co.

**Blocks, Creosoted.**
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
International Creosoting & Constr. Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

**Blooms, Steel.**
Carnegie Steel Co.
Republic Steel Corp.

**Blower Fittings, Automatic Smokebox.**
Barco Mfg. Co.

**Blowers, Turbo.**
Ingersoll-Rand Co.

**Blowtorches, Acetylene.**
Oxweld Railroad Service Co., The.

**Boiler (all types).**
Baldwin Locomotive Works, The.

**Boiler Checks.**
Prime Manufacturing Co., The.

**Boilers, Locomotive.**
American Locomotive Co.
Baldwin Locomotive Works
Lima Locomotive Works.

**Boilers, Scale Proof.**
Industrial Brownhoist Corp.

**Bolsters, Steel.**
American Steel Foundries.
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach. Co.
Bradford Corporation.
Brill Co., The J. G.
Buckeye Steel Castings Co.
Gould Coupler Co., The.
Mt. Vernon Car Mfg. Co.
Ohio Steel Foundry Co., The
Pressed Steel Car Co.
Symington & Son, Inc., T. H.

**Bolts and Nuts.**
Baldwin Locomotive Works, The
Bethlehem Steel Co.
Buffalo Brake Beam Co.
Dardelet Threadlock Corp.
Neely Nut & Bolt Co.
Russell, Burdsall & Ward Bolt and Nut Co.
Ryerson & Son, Joseph T.
Westinghouse Elec. & Mfg. Co.

**Bolts & Nuts, Monel Metal.**
International Nickel Co., The.

**Bolts, Patch.**
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

**Bolts, Track.**
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

**Bonders, Rail.**
Q & C Co., The.

**Bonding Rail Outfits.**
Ingersoll-Rand Co.

**Bonds, Rail.**
American Steel & Wire Co.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

**Bonds, Signal.**
American Steel & Wire Co.
Railroad Supply Co.

**Bond, Wire Protection.**
P & M Co., The.

**Boosters, Locomotives.**
Franklin Railway Supply Co., Inc.

**Boring & Drilling Machines, Horizontal.**
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.

**Boring Machines, Car Wheel**
Sellers & Co., Inc., Wm.

**Boring & Turning Mills, Horizontal.**
Sellers & Co., Inc., Wm.

**Boring & Turning Mills, Vertical.**
Sellers & Co., Inc., Wm.

**Braces, Rail**
Bettendorf Co., The.
Fort Pitt Malleable Iron Co.
National Malleable & Steel Castings Co.
Q & C Co., The.
Ramapo Ajax Co.
Symington Co., The.

**Brake Beam Safety Guards.**
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.

**Brake Beam Supports.**
American Steel Foundries.
Brill Co., The J. G.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.

**Brake Beams.**
American Steel Foundries.
Bradford Corporation.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
Hunt-Spiller Mfg. Corp.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Pressed Steel Car. Co.

**Brake Drums.**
American Car & Foundry Motors Co.
Hunt-Spiller Mfg. Corp.

**Brake Forgings, Pins, Levers, etc.**
American Steel Foundries.
Brill Co., The J. G.
Buffalo Brake Beam Co.
Davis Brake Beam Co.
Mt. Vernon Car Mfg. Co.
Schaefer Equipment Co.

**Brakes, Hand.**
National Brake Co.

**Brake Heads.**
American Steel Foundries.
Brill Co., The J. G.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
Pressed Steel Car Co.

**Brake Jaws.**
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Schaefer Equipment Co.

**Brake Shoes.**
American Brake Shoe & Foundry Co.
American Steel Foundries.
Brill Co., The J. G.
Buckeye Steel Castings Co.
Fort Pitt Malleable Iron Co.
Mt. Vernon Car Mfg. Co.

**Brakes, Air.**
General Electric Co.
New York Air Brake Co.
Westinghouse Air Brake Co.

**Brakes, Clasp.**
American Steel Foundries.

**Brakes, Electric.**
New York Air Brake Co.
Westinghouse Air Brake Co.

**Brakes, Hand.**
Miner, W. H.
National Brake Co.
National Malleable & Steel Castings Co.
Wine Railway Appliance Co.

**Brass, Sash.**
Edwards Co., O. M.

**Brick, Locomotive Arch.**
American Arch Co., Inc.

**Bridge Builders.**
American Bridge Co.
Bethlehem Steel Co.

**Bridge & Crossing Planks, Treated.**
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

**Bridge Flooring.**
Carey Co., The, Philip.

**Bridge Material, Treated.**
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

**Bridge Stringers — (See Stringers, Bridge).**

**Bronze Powder, Aluminum.**
Aluminum Co. of America.

**Bucket Handling.**
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

**Buckets, Grab.**
American Bridge Co.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

**Buffers, Friction.**
Edgewater Steel Co.
Miner, W. H.
Standard Coupler Co.
Westinghouse Air Brake Co.

**Buffers, Radial.**
Franklin Railway Supply Co., Inc.

**Building Materials.**
Carey & Co., Philip, The.
Johns-Manville Corp.

**Buildings, Iron, Steel and Steel Concrete.**
American Bridge Co.
United Engineers & Constructors, Inc.

**Bulldozers.**
Ryerson & Son, Joseph T.

**Buses, Motor.**
Reo Motor Car Co.

**Cable Accessories, Electrical.**
Graybar Electric Co.

**Cables, Electric.**
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Co.
Graybar Electric Co.
Kerite Insulated Wire & Cable Co.

**Cableways—(See Tramways).**

**Caps, Grease.**
Prime Mfg. Co.. The.

**Carbide, Calcium.**
Oxweld Railroad Co., The.
Union Carbide Sales Co.

**Car Insulation.**
Carey & Co., Philip, The.
Wood Conversion Co.

**Car Lighting Equipment—(See Lighting, Car Equipment).**

**Carlines.**
Hutchins Car Rfg. Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

**Car Material, Wood.**
Central Coal & Coke Co.

**Car Parts and Appliances.**
Pressed Steel Car Co.
Pullman Car & Mfg. Corp.

**Car Parts, Freight.**
Bettendorf Co., The.
General American Tank Car Corporation.
Pressed Steel Car Co.

**Car Parts, Passenger.**
Brill Co., The J. G.
St. Louis Car Co.

**Car Repairs.**
General American Tank Car Corporation.
Pressed Steel Car Co.
St. Louis Car Co.
Tennessee Coal, Iron & Railroad Co.

**Car Retarder Systems.**
General Railway Signal Co.
Union Switch & Signal Co.

**Car Siding — (See Siding, Car, etc.).**

**Cars, Baggage.**
Brill Co., The J. G.
Pressed Steel Car Co.
St. Louis Car Co.

**Cars, Ballast.**
Bethlehem Steel Co.
General American Tank Car Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

**Cars, Caboose, Coal & Stock.**
Mt. Vernon Car Mfg. Co.

**Cars, Convertible.**
Mt. Vernon Car Mfg. Co.

**Cars, Dump.**
Bethlehem Steel Co.
Bettendorf Co., The.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

**Cars, Flat, Narrow Gauge.**
Bettendorf Co., The.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

**Cars, Freight.**
Bethlehem Steel Co.
Bettendorf Co., The.
General American Tank Car Corp.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Pullman Car & Mfg. Co.

**Cars, Freight (New and Repaired).**
Bethlehem Steel Co.
Bettendorf Co., The.
General American Tank Car Corp.
Pressed Steel Car Co.

**Cars, Gasoline-Electric.**
Brill Co., The J. G.
Electro-Motive Co.
St. Louis Car Co.

**Cars, Gasoline Motor.**
Brill Co., The J. G.

**Cars, Hand & Push.**
Fairbanks-Morse & Co.

**Cars, Industrial.**
Bethlehem Steel Co.
Brill Co., The J. G.
General American Tank Car Corp.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

**Cars, Motor.**
Fairbanks-Morse & Co.

**Cars, Motor Inspection.**
Fairbanks-Morse & Co.

**Cars, Oil Electric.**
Westinghouse Elec. & Mfg. Co.

**Cars, Ore.**
Brill Co., The J. G.
General American Tank Car Corp.
Pressed Steel Car Co.

**Cars, Passenger.**
Bethlehem Steel Co.
Brill Co., The J. G.
Electro-Motive Co.
Pressed Steel Car Co.
Pullman Car & Mfg. Corp.

**Cars, Power Units.**
Brill Co., The J. G.
Electro-Motive Co.

**Cars, Quarry.**
Pressed Steel Car Co.
Western Wheeled Scraper Co.

**Cars, Rebuilt and Repaired.**
Bettendorf Co., The.
General American Tank Car Corp.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

**Cars, Refrigerator.**
General American Tank Car Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

**Cars, Second-Hand.**
Pressed Steel Car Co.
Western Wheeled Scraper Co.

**Cars, Self-Propelled Passenger.**
Brill Co., The J. G.
Electro-Motive Co.
General Electric Co.
Pullman Car & Mfg. Corp.
Westinghouse Elec. & Mfg. Co.

**Cars, Spreader.**
Western Wheeled Scraper Co.

**Cars, Tank.**
Bethlehem Steel Co.
General American Tank Car Corp.
Indian Refining Co.
Pressed Steel Car Co.

**Cars, Dump.**
Western Wheeled Scraper Co.

**Castings, Alloy Steel.**
Symington Co., The.
Union Spring & Mfg. Co.

**Castings, Brass and Bronze.**
Baldwin Locomotive Works, The.
General Railway Signal Co.
Magnus Co., Inc.
National Bearing Metals Corp.
Union Switch & Signal Co.

**Castings, Gray Iron.**
American Brake Shoe & Foundry Co.
American Locomotive Co.
Baldwin Locomotive Works.
General Railway Signal Co.
Mt. Vernon Car Mfg. Co.
Ramapo Ajax Corp.
Union Switch & Signal Co.

**Castings, Gun Iron.**
Hunt-Spiller Mfg. Corp.

**Castings, Iron & Steel.**
Baldwin Locomotive Works, The.
Industrial Brownhoist Corp.

**Castings, Malleable Iron.**
Buckeye Steel Castings Co.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
Fort Pitt Malleable Iron Co.
National Malleable & Steel Castings Co.
P & M Company, The.
Pressed Steel Car Co.
Symington Co., The.
Universal Draft Gear Attachment Co.

**Castings, Monel Metal.**
International Nickel Co., The.

**Castings, Steel.**
Allegheny Steel Co.
American Locomotive Co.
American Steel Foundries.
Bethlehem Steel Co.
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach. Co.
Buckeye Steel Castings Co.
General Steel Castings Corp.
Gould Coupler Co., The.
McConway & Torley Co.
Midvale Co., The.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Standard Steel Works Co.
Union Spring & Mfg. Co.
Union Steel Casting Co.
Universal Draft Gear Attachment Co.

**Castings, Steel Loco.**
Birdsboro Steel Foundry & Machine Co.
General Steel Castings Corp.
Gould Coupler Co., The.
Ohio Steel Foundry Co., The.
Standard Steel Works Co.
Union Steel Casting Co.

**Castings, Steel Vanadium.**
Birdsboro Steel Foundry & Machine Co.
Brill Co., The J. G.
Ohio Steel Foundry Co., The.
Standard Steel Works Co.
Union Steel Casting Co.

**Catchbasins, Iron.**
Armco Culvert Mfrs. Assoc.

**Cellers, Engine Truck.**
Ardco Mfg. Co.

**Cement Car, Asphalt.**
Lehon Co., The.
Sherwin-Williams Co.

**Cement, High Temperature.**
Carey Co., Philip, The.
Johns-Manville Corp.

**Cements, Asbestos and Magnesia.**
Carey Co., Philip, The.

**Center Plates—(See Bearings, Center).**

**Center Sills.**
Bettendorf Co., The.
Bradford Corporation.

**Chain, Monel Metal.**
International Nickel Co., The.

**Chemicals.**
Bird-Archer Co., The.
Dearborn Chemical Co.
Hunt Co., Robert W.

**Chemicals, Boiler.**
Bird-Archer Co., The.
Dearborn Chemical Co.

**Chemicals, Cleaning.**
Oakite Products, Inc.

**Chemists.**
Bird-Archer Co., The.
Dearborn Chemical Co.
Hunt Co., Robert W.
Pittsburgh Testing Laboratory.

**Chromium Plating.**
Worthington Pump & Machinery Corp.

**Chucks, Lathe.**
Ryerson & Son, Jos. T.

**Cinder Handling Plants.**
Roberts & Schaefer Co.

**Circuit Breakers.**
General Electric Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

**Clamps, Forging.**
Ryerson & Son, Jos. T.

**Clamps, Guard Rail.**
O. & C. Co., The.
Westinghouse Air Brake Co.

**Clamps, Hose.**
Ingersoll-Rand Co.
National Malleable & Steel Castings Co.
Vapor Car Heating & Lighting Co.
Westinghouse Air Brake Co.

**Clamps, Pipe.**
Franklin Railway Supply Co., Inc.
National Malleable & Steel Castings Co.

**Clamps, Rail Cutting.**
Oxweld Railroad Service Co., The.

**Classification Yard Systems.**
General Railway Signal Co.
Union Switch & Signal Co.

**Cleaners, Aircraft.**
Oakite Products, Inc.

**Cleaners, Air Pump.**
Oakite Products, Inc.
Westinghouse Air Brake Co.

**Cleaners, Bus & Truck.**
Oakite Products, Inc.

**Cleaners, Car.**
Oakite Products, Inc.

**Cleaners, Flue.**
Ryerson & Son, Jos. T.

**Cleaners, General.**
Oakite Products, Inc.

**Cleaners, Locomotive.**
Oakite Products, Inc.

**Cleaners, Metal.**
Oakite Products, Inc.

**Clips, Wire Rope.**
American Steel & Wire Co.

**Coach and Coach Yard Steam Joints—(See Joints, etc.)**

**Coaches, Motor.**
American Car & Foundry Motors Co.
Dodge Motor Truck Corp.
International Harvester Co.
White Co., The.

**Coaches, SecondHand.**
Hyman-Michaels Co.

**Coal, Ore & Ash Handling Machinery.**
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.
Roberts & Schaefer Co.

**Coal Pushers.**
Standard Stoker Co.

**Coaling Stations.**
American Bridge Co.
FairbanksMorse & Co.
Roberts & Schaefer Co.

**Cocks, Angle.**
Westinghouse Air Brake Co.

**Cocks, Blow-Off.**
Bird-Archer Co., The.

**Cocks, Cylinder.**
Prime Manufacturing Co., The.

**Columns, Water.**
Prime Manufacturing Co., The.

**Combination Crane Pile Drivers.**
Industrial Brownhoist Corp.

**Compounds, Boiler.**
Dearborn Chemical Co.
Bird-Archer Co., The.

**Compounds, Cleaning.**
Oakite Products, Inc.

**Compounds, Cutting.**
Oakite Products, Inc.

**Compounds, Grinding.**
Oakite Products, Inc.

**Compounds, Paint Removing.**
Oakite Products, Inc.

**Compounds, Rust Proofing.**
Oakite Products, Inc.

**Compressors, Air.**
Ingersoll-Rand Co.
New York Air Brake Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

**Concrete Floor Slabs.**
Federal American Cement Tile Co.

**Concrete Reinforcement.**
American Steel & Wire Co.
Carnegie Steel Co.
Ryerson & Son, Jos. T.

**Concrete Roofing, Tile.**
Federal American Cement Tile Co.

**Condensers.**
Ingersoll-Rand Co.

**Condensing Apparatus.**
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

**Conduit, Rigid.**
Aluminum Co. of America.

**Conduits, Metallic Flexible.**
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.
Graybar Electric Co.
Vapor Car Heating Co., Inc.

**Conduit, Underground.**
Graybar Electric Co.
Johns-Manville Corp.

**Connections, Lever.**
National Malleable & Steel Castings Co.

**Connections, Truck.**
National Malleable & Steel Castings Co.

**Connections, Truck Lever.**
Schaefer Equipment Co.

**Contraction Joint.**
General Railway Signal Co.

**Control Devices, Train Speed.**
Union Switch & Signal Co.

**Control, Locomotive.**
Valve Pilot Co.

**Controllers, Electric.**
General Electric Co.
Westinghouse Electric & Mfg. Co.

**Conveying Machinery.**
American Bridge Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

**Corrugated Sheet.**
Aluminum Co. of America.

**Conveyor, Ash—(See Coal, Ore and Ash Handling Mach.).**

**Coupler Pockets—(See Draft Yokes).**

**Coupler Yokes.**
Bettendorf Co., The.
Gould Coupler Co.
Symington Co., The.

**Couplers.**
American Steel Foundries.
Buckeye Steel Castings Co.
Franklin Railway Supply Co., Inc.
Gould Coupler Co., The.
McConway & Torley Co.
National Malleable & Steel Castings Co.
Standard Coupler Co.
Westinghouse Air Brake Co.

**Couplings, Hose.**
Fort Pitt Malleable Iron Co.
Gold Car Heating & Lighting Co.
Ingersoll-Rand Co.
Vapor Car Heating Co., Inc.
Westinghouse Air Brake Co.

**Cranes, Ballast Cleaning.**
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

**Cranes, Barge.**
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

**Cranes, Bracket.**
Shephard-Niles Crane & Hoist Corp.

**Cranes, Crawler.**
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

**Cranes, Crawling Shovels and Draglines.**
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

**Cranes, Diesel.**
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

**Cranes, Electric Traveling.**
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

**Cranes, Gantry.**
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.
Shephard-Niles Crane & Hoist Corp.

**Cranes, Gasoline.**
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

**Cranes, Grab Bucket.**
Milwaukee Electric Crane & Hoist Corp.

**Cranes, Handpower.**
Industrial Brownhoist Corp.
Shephard-Niles Crane & Hoist Corp.

**Cranes, Jib.**
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Worthington Pump & Machinery Corp.

**Cranes, Locomotive.**
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.

**Cranes, Overhead.**
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Shephard-Niles Crane & Hoist Corp.

**Cranes, Pillar.**
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

**Cranes, Portable.**
Orton Crane & Shovel Co.

**Cranes, Transfer.**
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

**Cranes, Traveling.**
Milwaukee Electric Crane & Hoist Corp.
Shephard-Niles Crane & Hoist Corp.

**Cranes, Wharf.**
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

**Cranes, Wrecking.**
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

**Crank Pins — (See Pins, Crank).**

**Creosote.**
American Creosoting Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
International Creosoting & Constr. Co.
National Lumber & Creosoting Co.

**Creosote, Wood Preservative Treatment.**
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
National Lumber & Creosoting Co.

**Cribbing Units.**
Federal American Cement Tile Co.

**Cross Arms, Treated.**
American Creosoting Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
Graybar Electric Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

**Cross Ties, Treated.**
American Creosoting Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

**Cross Ties, Steel.**
Bethlehem Steel Co.

**Crossheads & Shoes.**
Baldwin Locomotive Wks.
Barco Mfg. Co.
International Creosoting & Construction Co.

**Crossing Signals & Signs.**
Railroad Supply Co.

**Crossings—(See Frogs and Crossings).**

**Crossings, Pavement.**
Carey Co., The Philip.

**Crushers, Coal.**
American Sheet & Tin Plate Co.
Orton Crane & Shovel Co.

**Culverts.**
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.
Toncan Culvert Manufacturers' Association.

**Culverts, Corrugated Iron**
Armco Culvert Manufacturers' Association.
Republic Steel Corp.

**Culverts, Part Circle**
Armco Culvert Manufacturers Association

**Culverts, Treated.**
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

**Cups, Oil.**
New York Air Brake Co.
Prime Manufacturing Co., The.
Westinghouse Air Brake Co.

**Curtain Material, Car.**
Ryerson & Son, Jos. T.

**Curtains, Cab.**
Lehon Co., The.

**Cutting and Welding Apparatus.**
Electric Railweld Service Corp.
Oxweld Railroad Service Co.
Westinghouse Electric & Mfg. Co.

**Cut-Off Indicators and Recorders.**

**Cylinder Parts, Finished and Rough.**
National Tube Co.
Valve Pilot Co.

**Cylinders, Air Brake.**
Westinghouse Air Brake Co.

**Cylinders, Cast Steel Locomotive.**
General Steel Castings Corp.
Union Steel Casting Co.

**Cylinders, Oxy-Acetylene.**
Oxweld Railroad Co., The.

**Deoxidizers.**
Q & C Co., The.
Vanadium Corp. of America.

**Derricks.**
Industrial Brownhoist Corp.

**Diesel Electric Power Plants.**
Fairbanks-Morse & Co.
Westinghouse Elec. & Mfg. Co.

**Dirt Collectors.**
New York Air Brake Co.
Westinghouse Air Brake Co.

**Disinfectants.**
West Disinfecting Co.

**Dispatching Systems.**
General Railway Signal Co.
Union Switch & Signal Co.

**Ditching Machinery.**
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

**Door Fixtures — (See Fixtures, Car Door).**

**Doors, Car.**
Camel Sales Co.
Chicago Railway Equipment Co.
Miner, W. H.
Wine Railway Appliance Co.

**Doors, Locomotive Firebox.**
Franklin Railway Supply Co., Inc.

**Doors, Rolling, Steel.**
Kinnear Mfg. Co.

**Draft Arms.**
American Steel Foundries.
Birdsboro Steel Foundry & Machine Co.
Bradford Corporation.
Symington Co., The.
Universal Draft Gear Attachment Co.

**Draft Gear Attachments.**
Symington Co., The

**Draft Gears.**
American Steel Foundries.
Bradford Corporation.
Cardwell-Westinghouse Co.
Edgewater Steel Co.
Fort Pitt Malleable Iron Co.
Miner, W. H.
National Malleable & Steel Castings Co.
Standard Coupler Co.
Union Draft Gear Co.
Universal Draft Gear Attachment Co.

**Draft Yokes.**
American Steel Foundries.
Bettendorf Co., The.
Buckeye Steel Castings Co.
Gould Coupler Co., The.
McConway & Torley Co.
Miner, W. H.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Steel Car Forge Co.
Symington Co., The.
Universal Draft Gear Attachment Co.

**Drainage Gates, Automatic**
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

**Drains, Perforated Iron.**
Republic Steel Corp.

**Drawbar Centering Device.**
Gould Coupler Co., The.
Miner, W. H.

**Drawbars, Unit Safety.**
Franklin Railway Supply Co., Inc.
Industrial Brownhoist Corp.

**Dredging Machinery.**
Industrial Brownhoist Corp.

**Drilling Machines.**
Sellers & Co., Inc., Wm.

**Drilling Machines, Bonding.**
Railroad Supply Co.

**Drilling Machines, Pneumatic**
Ingersoll-Rand Co.

**Drilling Machines, Rock.**
General Electric Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

**Drilling Machines, Upright and Radial.**
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.

**Drills.**
Ingersoll-Rand Co.

**Drills, Close Corner.**
Ingersoll-Rand Co.

**Drills, Concrete.**
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

**Drills, Steel Rock and Steel Sharpened.**
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

**Drills, Track & Bending.**
Bird-Archer Co., The.
Ingersoll-Rand Co.

**Drive Gas Electric Coaches.**
General Electric Co.

**Drive Gas Electric Locomotives**
Westinghouse Electric & Mfg Co.

**Driving Boxes (Extended Main).**
Franklin Railway Supply Co., Inc.

**Drop Door Mechanism.**
Wine Railway Appliance Co.

**Dynamos—(See Generators, Electric).**

**Electrical Cable Accessories.**
General Electric Supply Corp.

**Electric Cables.**
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Supply Corp.

**Electrical Instruments.**
Electric Service Supplies Co.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

**Electrical Supplies.**
General Electric Co.
General Electric Supply Corp.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

**Electrification, Railroad.**
Battey & Kipp.
General Electric Co.
United Engineers & Constructors, Inc.
Westinghouse Elec. & Mfg. Co.

**Electric Heaters.**
General Electric Supply Corp.

**Electrical Insulation.**
General Cable Corp.
General Electric Supply Corp.

**Electrical Porcelain Insulators.**
General Electric Supply Corp.

**Electric Motors.**
General Electric Supply Corp.

**Electric Rivet Heaters.**
General Electric Supply Corp.

**Electric Switches.**
General Electric Supply Corp.

**Enamels.**
Lowe Bros. Co., The.
Sherwin-Williams Co.

**End Frames, Cast Steel, Passenger Car.**
General Steel Castings Corp.

**Ends, Steel.**
Hutchins Car Rfg. Co.
Union Metal Products Co.

**Engineers, Consulting, Civil, Elec., Hydraulic. Mechanical.**
Battey & Kipp.
Hunt Co., Robt. W.
Muhlfeld, John E.
United Engineers & Constructors, Inc.

**Engineers, Contracting.**
Battey & Kipp.
United Engineers & Constructors, Inc.

**Engineers and Contractors.**
Battey & Kipp.
Hunt Co., Robert W.
Muhlfeld, John E.
United Engineers & Constructors, Inc.

**Engineers, Construction.**
Battey & Kipp.
Roberts & Schaefer Co.
United Engineers & Constructors, Inc.

**Engineers and Contractors, Elec., Hydraulic, Mech.**
Battey & Kipp.
Hunt Co., Robert W.
Muhlfeld, John E.
Roberts & Schaefer Co.

**Engineers, Inspecting.**
Gulick-Henderson Co.
Hunt Co., Robert W.
Muhlfeld, John E.
Pittsburgh Testing Laboratory.
United Engineers & Constructors, Inc.

**Engineers, Valuation.**
Hunt Co., Robert W.
United Engineers & Constructors, Inc.

**Engines, Crude & Fuel Oil.**
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

**Engines, Diesel.**
Worthington Pump & Machinery Corp.

**Engines, Gas.**
Brill Co., The J. G.
Worthington Pump & Machinery Corp.

**Engines, Gas & Gasoline.**
American Car & Foundry Motors Co.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

**Engines, Hoisting.**
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

**Excavators.**
Industrial Brownhoist Corp.

**Exhaust & Heater Pipe.**
Union Asbestos & Rubber Co.

**Exhaust & Ventilating Fans.**
General Electric Supply Corp.

**Expanders, Tube.**
Ryerson & Son, Joseph T.

**Fans, Exhaust & Ventilating.**
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

**Fasteners, Car Door.**
Camel Sales Co.
Fort Pitt Malleable Iron Co.
Miner, W. H.
National Malleable & Steel Castings Co.

**Feed Water Heater Systems.**
Bird-Archer Co., The.
Coffin, Jr., Co., The J. S.
Worthington Pump & Machinery Corp.

**Fencing Wire—(See Wire, Fence).**

**Fence Posts, Treated.**
American Steel & Wire Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

**Ferro Alloys.**
Vanadium Corp. of America.

**Ferro, Chromium.**
Vanadium Corp. of America.

**Ferro, Molybdenum.**
Electro Metallurgical Sales Corp.
Vanadium Corp. of America.

**Ferro, Silicon.**
Vanadium Corp. of America.

**Ferro, Tungsten.**
Vanadium Corp. of America.

**Ferro, Vanadium.**
Vanadium Corp. of America.

**Filters, Air.**
New York Air Brake Co.
Westinghouse Air Brake Co.

**Filters, Water & Industrial.**
Graver Tank & Mfg. Corp.

**Filtration Plants (Water).**
Graver Tank & Mfg. Corp.

**Fireboxes.**
American Locomotive Co.
Baldwin Locomotive Works.

**Fire Fighting & Protection Equipment.**
Johns-Manville Corp.

**Fittings, Air Brakes.**
Westinghouse Air Brake Co.

**Fittings, Steam.**
Vapor Car Heating Co., Inc.

**Fixtures, Car Door.**
Camel Sales Co.
Chicago Railway Equipment Co.
Miner, W. H.
National Malleable & Steel Castings Co.

**Flangers, Snow.**
Q & C Co., The.

**Floodlights.**
General Electric Supply Corp.
Graybar Electric Co.
Oxweld Railroad Service Co.
Pyle-National Co.
Symington Co., The.
Westinghouse Elec. & Mfg. Co.

**Floodlights, Acetylene.**
Oxweld Railroad Service Co., The.

**Flooring.**
Carey & Co., Philip, The.
Johns-Manville Corp.

**Flooring, Car.**
Tuco Products Corp.

**Flooring, Coach.**
Tuco Products Corp.

**Flooring, Composition.**
Johns-Manville Corp.
Tuco Products Corp.

**Flooring, Treated.**
Central Coal & Coke Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
National Lumber & Creosoting Co.

**Floor Plates, Steel.**
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Company

**Floor Slabs, Concrete.**
American Cement Tile Mfg. Co.

**Flue Cleaners—(See Cleaners, Flue).**

**Flue Cutters—(See Cutters, Flue).**

**Flues, Boiler—(See Tubes, Boiler).**

**Flue Shop Equipment.**
Ryerson & Son, Joseph T.

**Forges, Rivet Heating.**
Ryerson & Son, Joseph T.

**Forging Hammers.**
Industrial Brownhoist Corp.

**Forgings.**
American Bridge Co.
American Steel Foundries.
Baldwin Locomotive Works, The.
Bethlehem Steel Co.

Brill Co., The J. G.
Carnegie Steel Co.
Edgewater Steel Co.
General Railway Signal Co.
Gould Coupler Co., The.
Illinois Steel Co.
Midvale Co., The.
Mt. Vernon Car Mfg. Co.
Neely Nut & Bolt Co.
Pressed Steel Car Co.
Standard Steel Works Co.
Steel Car Forge Co.
Universal Draft Gear Attachment Co.

**Forgings, Drop.**
Baldwin Locomotive Works, The.
Brill Co., The J. G.
General Railway Signal Co.
Steel Car Forge Co.
Union Switch & Signal Co.

**Forgings, Monel Metal.**
International Nickel Co., The.

**Foundry Supplies.**
Bird-Archer Co., The.

**Frames, Cast Steel Locomotive**
General Steel Castings Corp.

**Frames, Locomotive.**
American Steel Foundries.
American Locomotive Co.
Baldwin Locomotive Works.
Birdsboro Steel Foundry & Machine Co.
Ohio Steel Foundry Co., The.
Union Steel Casting Co.

**Frames, Truck.**
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works
Bettendorf Co., The.
Birdsboro Steel Foundry & Machine Co.
Buckeye Steel Castings Co.
Brill Co., The J. G.
Franklin Railway Supply Co., Inc.
Gould Coupler Co., The.
Ohio Steel Foundry Co., The.
Pressed Steel Car Co.
Pyle-National Co.
Symington Co., The.

**Frames, Vanadium.**
American Locomotive Co.
Baldwin Locomotive Works.
Birdsboro Steel Foundry & Machine Co.
Union Steel Casting Co.

**Frogs and Crossings.**
Bethlehem Steel Co.
Ramapo Ajax Corp.

**Fulcrums, Brake Beam.**
American Steel Foundries.
Brill Co., The J. G.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
National Malleable & Steel Castings Co.

**Furnaces, Electric.**
General Electric Co.
Westinghouse Elec. & Mfg. Co.

**Furnaces, Gasoline.**
Railroad Supply Co.

**Furnaces, Rivet Heating—(See Forges, Rivet Heating).**

**Furniture.**
Aluminum Co. of America

**Gage Testers—(See Testers, Gage).**

**Gages, Air.**
Westinghouse Air Brake Co.

**Gages, Oxy-Acetylene.**
Oxweld Railroad Service Co., The.

**Gages, Steam.**
Ashton Valve Co.

**Gages, Tire.**
Schrader's Son, Inc., A.

**Gages, Wheel Press Recording.**
Ashton Valve Co.

**Gaskets.**
Westinghouse Air Brake Co.

**Gasoline.**
Ethyl Gasoline Corp.

**Gear Blanks, Rolled Steel.**
Edgewater Steel Co.
Standard Steel Works Co.

**Gears and Pinions.**
American Steel Foundries.
Westinghouse Elec. & Mfg. Co.

**Gears, Silent.**
General Electric Co.
Westinghouse Elec. & Mfg. Co.

**Gears, Valve — (See Valve Gears).**

**Generators, Acetylene.**
Oxweld Railroad Service Co.

**Generators, Electric.**
Fairbanks-Morse & Co.
General Electric Co.
Graybar Electric Co.
Sunbeam Electric Mfg. Co.
Westinghouse Elec. & Mfg. Co.

**Goggles, Welding.**
Oxweld Railroad Service Co., The.
Sunbeam Electric Mfg. Co.

**Graders, Elevating.**
Western Wheeled Scraper Co.

**Grapples, Wood.**
Industrial Brownhoist Corp.

**Grate Bars.**
Q & C Co., The.

**Grate Shakers, Automatic.**
Franklin Railway Supply Co., Inc.

**Grates.**
Firebar Corp.

**Grease Forming Machines.**
Franklin Railway Supply Co., Inc.

**Grey Iron.**
American Brake Shoe & Foundry Co.

**Grinders, Internal.**
Micro Machine Co.

**Grinders, Portable Crank Pin.**
Micro Machine Co.

**Grinding Machines.**
Sellers & Co., Inc., Wm.

**Grinding Machines, Portable.**
Ingersoll-Rand Co.
Ryerson & Son, Inc., Joseph T.

**Guard Rails, Treated.**
Curtin-Howe Corp.
International Creosoting & Construction Co.

**Guard Rails, Foot Guard.**
Q & C Co., The.

**Guard Rails (One Piece).**
Bethlehem Steel Co.
Ramapo Ajax Corp.

**Guard Switch Point.**
Q & C Co., The.

**Guards, Cattle.**
American Bridge Co.

**Guards, Dust.**
Gould Coupler Co., The.
Symington Co., The.

**Hair Felt.**
Johns-Manville Corp.

**Hammers, Pneumatic.**
Ingersoll-Rand Co.

**Hammers, Riveting.**
Ingersoll-Rand Co.

**Hammers, Steam.**
Industrial Brownhoist Corp.
Sellers & Co., Inc., Wm.

**Hand Brakes—(See Brakes, Hand).**

**Hangers, Ball Bearing.**
S. K. F. Industries, Inc.

**Hand Rails & Fittings.**
Aluminum Co. of America.

**Hangers, Bottom Rod Safety.**
Chicago Railway Equipment Co.

**Hangers, Car Door—(See Fixtures, Car Door).**

**Headgates, Sliding**
Armco Culvert Manufacturers Association

**Headlight Repair Parts, Electric.**
Electric Service Supplies Co.
Pyle-National Co.
Sunbeam Electric Mfg. Co.

**Headlights, Electric.**
General Electric Co.
Pyle-National Co., The.
Sunbeam Electric Mfg. Co.
Westinghouse Electric & Mfg. Co.

**Headlights, Reflectors & Cases.**
Pyle-National Co.
Sunbeam Electric Mfg. Co.

**Heaters, Electric.**
Gold Car Heating & Lighting Co.
Westinghouse Electric & Mfg. Co.

**Heaters, Feedwater.**
Graver Tank & Mfg. Corp.

**Heaters, Feedwater Locomotive.**
Coffin Co., Jr., The J. S.
Superheater Company, The.
Worthington Pump & Machinery Corp.

**Heaters, Feed Water, Stationary.**
Brill Co., The J. G.
Worthington Pump & Machinery Corp.

**Heating & Ventilating Apparatus.**
Gold Car Heating & Lighting Co.
Vapor Car Heating Co., Inc.
Westinghouse Electric & Mfg. Co.

**Heating Equipment, Car.**
Gold Car Heating & Lighting Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

**Heating Systems, Car (Electric and Steam).**
Gold Car Heating & Lighting Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

**High Temperature Cements.**
Carey & Co., Philip, The.

**Highway Crossing Protection Devices.**
American Bridge Co.
Franklin Railway Supply Co., Inc.
Griswold Signal Co.
Railroad Supply Co.

**Hoists, Chain.**
Milwaukee Electric Crane & Hoist Corp.
Ryerson & Son., Jos. T.

**Hoists, Electric.**
Milwaukee Electric Crane & Hoist Corp.

**Hoists, Pneumatic.**
Ingersoll-Rand Co.

**Hoisting Machinery.**
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

**Hooks, Wrecking.**
National Malleable & Steel Castings Co.

**Horns, Pneuphonic.**
Westinghouse Air Brake Co.

**Hose, Air, Steam, Etc.**
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

**Hose, Oxy-Acetylene.**
Oxweld Railroad Service Co., The.

**Hose, Tender.**
Westinghouse Air Brake Co.

**Incandescent Lamps.**
General Electric Supply Corp.

**Indicators, Speed & Cut-off.**
Valve Pilot Co.

**Ingots.**
Birdsboro Steel Foundry & Machine Co.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
McConway & Torley Co.
Standard Steel Works Co.

**Injectors, Exhaust Steam.**
Sellers & Co., Inc., Wm.
Superheater Co., The.

**Inspection of Material and Equipment—(See Engineers, Inspection).**

**Insulated Wire.**
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Supply Corp.

**Insulation, Car.**
Carey Co., Philip, The.
Wood Conversion Co.

**Insulation, Car, Bldg.**
Carey Co., Philip, The.
JohnsManville Corp.
Lehon Co., The.
Tuco Products Corp.
Union Asbestos & Rubber Co.
Wood Conversion Co.

**Insulation, Electrical.**
General Electric Co.
Westinghouse Elec. & Mfg. Co.

**Insulation, Exhaust & Heater Pipe.**
Carey Co., Philip, The.
Johns-Manville Corp.
Tuco Products Corp.
Union Asbestos & Rubber Co.

**Insulation, Heat.**
Carey Co., Philip, The.
Miner, W. H.

**Insulation Tape.**
General Electric Supply Corp.

**Insulators, Electrical, Porcelain.**
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

**Interlocking Plant Equipment.**
General Railway Signal Co.
Union Switch & Signal Co.

**Iron Chain.**
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Ryerson & Son, Joseph T.

**Iron, Charcoal.**
Bethlehem Steel Co.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Ryerson & Son, Joseph T.

**Iron, Engine Bolt.**
Lockhart Iron & Steel Co.
Ryerson & Son, Joseph T.

**Iron, Forging Billets.**
Lockhart Iron & Steel Co.

**Iron, Hollow Staybolt.**
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

**Iron, Hollow Staybolt Bars.**
Bethlehem Steel Co.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

**Iron, Pig.**
Bethlehem Steel Co.

**Iron, Refined.**
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

**Iron, Staybolt — (See also Staybolts).**
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Reading Iron Co
Ryerson & Son, Joseph T.

**Jacking, Locomotive.**
Carey Co., Philip, The.

**Jacking Method of Installing Pipe**
Armco Cuvert Manufacturers Association

**Jacks, Smoke.**
Carey Co., Philip, The.
Johns Manville Corp.

**Joints, Air Reservoir.**
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

**Joints, Blow Off Line (Roundhouse).**
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

**Joints, Coach and Coach Yard.**
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

**Joints, Flexible.**
Franklin Railway Supply Co., Inc.
Vapor Car Heating Co., Inc.

**Joints, Flexible Ball.**
Barco Mfg. Co.

**Joints, Rail.**
American Steel Foundries.
Carnegie Steel Co.
Illinois Steel Co.
Q & C Co., The.
Rail Joint Co.
Union Switch & Signal Co.

**Joints, Steam, Air & Liquid.**
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.
Vapor Car Heating Co., Inc.

**Joints, Swing.**
Barco Mfg. Co.
Vapor Car Heating Co., Inc.

**Journal Boxes and Lids.**
Allegheny Steel Co.
American Steel Foundries.
Brill Co., The J. G.
Gould Coupler Co., The.
Hunt-Spiller Mfg. Corp.
National Malleable & Steel Castings Co.
Pullman Car & Mfg. Corp.
Railway Steel Spring Co.
Symington Co., The.
Union Spring & Mfg. Co.

**Journal Oilers, Car & Locomotive.**
Ardco Mfg. Co.

**Keys, Brake Shoe.**
Bradford Corporation.
Buffalo Brake Beam Co.
Mt. Vernon Car Mfg. Co.
Steel Car Forge Co.
Union Spring & Mfg. Co.

**Knuckles, Emergency.**
Q & C Co., The.

**Laboratories, Testing.**
Hunt Co., Robert W.
Pittsburgh Testing Laboratory.

**Lacquers.**
General Electric Supply Corp.
Sherwin-Williams Co.

**Ladders, Steel Car.**
Wine Railway Appliance Co.

**Lagging, Locomotive.**
Carey & Co., Philip, The.
Johns-Manville Corp.

**Lamps, Incandescent.**
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

**Lamps, Inspector's.**
Oxweld Railroad Service Co., The.

**Lath, Metal**
Armco Railroad Sales Co.

**Lathes, Axle.**
Sellers & Co., Inc., Wm.

**Lathes, Engine.**
Ryerson & Son, Joseph T.

**Lathes, Wheel.**
Sellers & Co., Inc., Wm.

**Lead, White.**
National Lead Co.

**Lighting Equipment, Car.**
Electric Storage Battery Co.

**Lighting Fixtures and Systems.**
General Electric Supply Corp.
Graybar Electric Co.
Pyle-National Co.

**Lighting Plants, Gas, Electric**
Pyle-National Co., The.
Sunbeam Electric Mfg. Co

**Lightning Arresters.**
General Electric Supply Corp.

**Line Material.**
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

**Lock Nuts—(See Nut Locks)**

**Locomotive Jacket Sheets.**
Armco Railroad Sales Co.

**Locomotive Water Conditioners**
Bird-Archer Co., The.

**Locomotives, Contractors.**
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

**Locomotives, Electric.**
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

**Locomotives, Gasoline.**
Baldwin Locomotive Works.

**Locomotives, Gas-Electric.**
Brill Co., The J. G.
Electro-Motive Co.

**Locomotives, Geared.**
Lima Locomotive Works.

**Locomotives, Industrial.**
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Lima Locomotive Works.
Westinghouse Elec. & Mfg. Co.

**Locomotives, Mine.**
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Lima Locomotive Works.
Westinghouse Elec. & Mfg. Co.

**Locomotives, Oil Engine, Electric Driven.**
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Elec. & Mfg. Co.
Whitcomb Co., Geo. D. The.

**Locomotives, Rebuilt.**
American Locomotive Co.

**Locomotives, Repair Parts.**
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

**Locomotives, Steam.**
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

**Locomotive Stokers.**
Standard Stoker Co.

**Locomotive Valve Pilot.**
Valve Pilot Co.

**Lubricators, Driving Box.**
Franklin Railway Supply Co., Inc.

**Lubricators, Piston Rod.**
Q & C Co., The.

**Lumber, Asbestos.**
Carey & Co., Philip, The.
Johns-Manville Corp.

**Lumber, Treated.**
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
Industrial Lumber & Creosoting Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

**Machinery, Hydraulic.**
Birdsboro Steel Foundry & Mach. Co.

**Machine Screws, Monel Metal**
International Nickel Co., The.

**Magnets, Lifting.**
Industrial Brownhoist Corp.
Electro Metallurgical Sales Corp.

**Mechanical Draft Apparatus—(See Heating and Vent. App.).**

**Mechanical Stokers.**
Standard Stoker Co.

**Melters, Snow, Electric.**
Q & C Co., The.

**Metallic Flexible Conduit.**
General Electric Supply Corp.

**Meters, Water & Oil.**
Worthington Pump & Machinery Corp.

**Milling Machines, Planer Type.**
Sellers & Co., Inc., Wm.

**Milling Machines, Plain and Universal.**
Ryerson & Son, Joseph T.

**Milling Machines, Portable Frame Jaw.**
Micro Machine Co.

**Mohair Upholstery Velvets.**
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

**Molybdenum Metal.**
Vanadium Corp. of America.

**Monel Metal, Rods, Sheets, Tubes, Wire, etc.**
International Nickel Co., The.

**Motors, Electric.**
Fairbanks-Morse & Co.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

**Motors & Generators.**
Fairbanks-Morse & Co.

**Moulding.**
Aluminum Co. of America.

**Multiple V Belt Drives.**
Worthington Pump & Machinery Corp.

**Nails.**
American Steel & Wire Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

**Nipples, Air Hose.**
Prime Manufacturing Co.

**Nozzles, Exhaust.**
Franklin Railway Supply Co., Inc.

**Nozzles, Oxy-Acetylene Cutting.**
Oxweld Railroad Service Co., The.

**Nuts—(See Bolts and Nuts).**

**Nut Locks.**
Dardelet Threadlock Corp.
Grip Nut Co.

**Nuts, Tank Hose.**
Prime Manufacturing Co., The.

**Office Appliances.**
Remington-Rand Business Service.

**Oils, Diesel Engine**
Vacuum Oil Co.

**Oil, Dynamo**
Vacuum Oil Co.

**Oil-Electric Locomotives.**
American Locomotive Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Elec. & Mfg. Co.

**Oil Filtering & Storage Systems.**
Graver Tank & Mfg. Corp

**Oils & Greases, Engine**
Vacuum Oil Co.

**Oils & Greases, Lubricating**
Vacuum Oil Co.

**Oils & Greases, Motor**
Vacuum Oil Co.

**Oil, Linseed.**
National Lead Co.

**Oils, Locomotive Valve**
Vacuum Oil Co.

**Oil Plugs, Steam Chest.**
Franklin Railway Supply Co., Inc.

**Oil, Turbine**
Vacuum Oil Co.

**Oxy-Acetylene Apparatus.**
Oxweld Railroad Service Co., The.

**Oxygen.**
Oxweld Railroad Service Co., The.

**Packing.**
Westinghouse Air Brake Co.

**Packing, Air Pump.**
Johns-Manville Corp.
Pilot Packing Co.
Union Asbestos & Rubber Co.
Westinghouse Air Brake Co.

**Packing, Asbestos.**

**Packing, Cylinder and Valve Ring.**
Johns-Manville Corp.
Hunt-Spiller Mfg. Corp.
Westinghouse Air Brake Co.

**Packing, Locomotive Cab Cock.**
Johns-Manville Corp.
Union Asbestos & Rubber Co.

**Packing, Ring Boiler.**
Union Asbestos & Rubber Co.

**Packing, Semi-Metallic.**
Pilot Packing Co.
Central Alloy Steel Corp.

**Packing, Sheet.**
Johns-Manville Corp.
Union Asbestos & Rubber Co.

**Packing, Soft.**
Carey & Co., Philip, The.
Johns-Manville Corp.
Pilot Packing Co.
Union Asbestos & Rubber Co.

**Packing, Throttle.**
Johns-Manville Corp.
Union Asbestos & Rubber Co.

**Paint Burners, Acetylene.**
Oxweld Railroad Service Co., The.

**Paint, Metal Protective.**
Lowe Bros. Co., The.
National Lead Co.
Sherwin-Williams Co.

**Paint, Powder.**
Aluminum Co. of America.

**Paint Spraying Equipment.**
De Vilbiss Mfg. Co., The.

**Paints.**
Lowe Bros. Co., The.
National Lead Co.
Sherwin-Williams Co.

**Paper, Carbon.**
Remington-Rand Business Service.

**Paper, Sheathing.**
Carey & Co., Philip, The.

**Patterns, for Iron, Steel & Brass Castings.**
Baldwin Locomotive Works, The.

**Pavement Breakers.**
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

**Pickling Equipment, Monel Metal.**
International Nickel Co., The.

**Pile Drivers.**
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

**Piling, Treated.**
American Creosoting Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

**Piling, Sheet Steel.**
American Bridge Co.
Carnegie Steel Co.
Inland Steel Company

**Pilot Beams, Cast Steel.**
General Steel Castings Corp.
Gould Coupler Co., The.

**Pilots, Cast Steel.**
General Steel Castings Corp.
Locomotive Finished Material Co.

**Pins, Air Brake & Clevis.**
Champion Rivet Co.

**Pins, Center.**
Miner, W. H.

**Pins, Coupler Knuckle.**
Champion Rivet Co.
McConway & Torley Co.
National Malleable & Steel Castings Co.

**Pins, Crank.**
American Locomotive Co.
Baldwin Locomotive Works.
Miner, Inc., W. H.
Standard Steel Works Co.
Union Asbestos & Rubber Corp.

**Pipe, Corrugated Iron**
Armco Culvert Manufacturers Association

**Pipe, Paved Invert**
Armco Culvert Manufacturers Association

**Pipe Coverings.**
Carey & Co., Philip, The.
Johns-Manville Corp.
Keasby & Mattison Co.

**Pipe Fittings—(See Fittings, Pipe).**

**Pipe, Metal Culvert.**
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Republic Steel Corp.

**Pipe, Perforated Iron**
Armco Culvert Manufacturers Association

**Pipe, Spiral Welded.**
Armco Railroad Sales Co.

**Pipe, Steel Signal.**
National Tube Co.

**Pipe, Spiral Welded.**
Armco Railroad Sales Co.

**Pipe, Wrought Iron.**
Byers Co., A. M.
Reading Iron Co.

**Planers, Plate.**
Ryerson & Son, Jos. T.
Sellers & Co., Inc., Wm.

**Plates.**
Steel Car Forge Co.

**Plates, Follower.**
Steel Car Forge Co.

**Plates, Boiler, Firebox—(See Steel Firebox).**

**Plates, Center—(See Bearings, Center).**

**Plates, Iron & Steel.**
Armco Railroad Sales Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

**Plate & Sheet Metal Work.**
Baldwin Locomotive Works, The.

**Plates, Tie.**
Illinois Steel Co.
Inland Steel Company.
Railroad Supply Co.
Tennessee Coal, Iron & Railroad Co.

**Plates, Tin and Terne.**
American Sheet & Tin Plate Co.

**Platforms, Car.**
Gould Coupler Co., The.
Standard Coupler Co.

**Platforms, Cast Steel, Passenger Car.**
General Steel Castings Corp.

**Plows, Railroad and Grading.**
Western Wheeled Scraper Co.

**Plows, Snow.**
American Locomotive Co.
Brill Co., The J. G.
Q & C Co., The.

**Plush, Mohair.**
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

**Pneumatic Tools.**
Ingersoll-Rand Co.

**Poles, Signal.**
American Creosoting Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
General Railway Signal Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.
Union Switch & Signal Co.

**Poles, Treated.**
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
General Electric Supply Corp.
Curtin-Howe Corp.
Graybar Electric Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

**Poles, Steel Tubular.**
Graybar Electric Co.
National Tube Co.

**Posts, Fence, Treated.**
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
Inland Steel Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

**Posts, Steel Fence.**
American Steel & Wire Co.
Q & C Co., The.

**Powder, Blasting—(See Explosives).**

**Powdered Coal Equipment.**
Muhlfeld, John E.

**Power Plants.**
General Electric Co.
Muhlfeld, John E.
United Engineers & Constructors, Inc.
Westinghouse Elec. & Mfg. Co.

**Power Transmission Supplies.**
Sellers & Co., Inc., Wm.

**Preservatives, Wood.**
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
National Lumber & Creosoting Co.

**Presses, Flanging Hydraulic.**
Birdsboro Steel Foundry & Machine Co.

**Presses, Hydraulic.**
Baldwin-Southwark Corp.
Birdsboro Steel Foundry & Machine Co.

**Presses, Wheel.**
Birdsboro Steel Foundry & Machine Co.
Sellers & Co., Inc., Wm.

**Pulverizers, Coal — (See Crushers, Coal).**

**Pumping Stations.**
Fairbanks-Morse & Co.

**Pump Liners, Monel Metal.**
International Nickel Co., The.

**Pump Rods, Monel Metal.**
International Nickel Co., The.

**Pump Shafts, Monel Metal.**
International Nickel Co., The.

**Pumps, Hydraulic.**
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

**Pumps & Pumping Mchy.**
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

**Pumps, Vacuum.**
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

**Punching and Shearing Machines.**
Ryerson & Son, Joseph T.

**Pushers, Coal.**
Standard Stoker Co.

**Pyrometers, Superheated Steam.**
Superheater Co., The.

**Rail Anchors.**
Bethlehem Steel Co.
P. & M. Co., The.

**Rail-Bonds.**
American Steel & Wire Co.
General Electric Co.
General Railway Signal Co.
Graybar Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

**Rail Braces — (See Braces, Rail).**

**Rail Reclamation Equipment.**
Ryerson & Son, Joseph T.

**Railroad Shops.**
United Engineers & Constructors, Inc.

**Rail Splice Plates — (See Joints, Rail).**

**Railroad Structures — (See Engineers and Contractors; also Building).**

**Rails.**
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Inc., Joseph T.
Tennessee Coal, Iron & Railroad Co.
Thomson Rail Corp.

**Railway Signals.**
General Electric Supply Corp.

**Rattan.**
Hale-Kilburn Co.
Heywood-Wakefield Co.

**Receivers, Air.**
Ingersoll-Rand Co.
Westinghouse Air Brake Co.

**Reconditioning, Rail Crossing and Frogs.**
Morrison Railway Supply Corp.

**Recorders, Speed & Cut-off.**
Valve Pilot Co.

**Rectifiers for Signal Work.**
General Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.

**Reducing Valves.**
Vapor Car Heating Co., Inc.

**Reflectors, Headlight.**
Pyle-National Co., The.
Sunbeam Electric Mfg. Co.

**Refrigerators.**
Wine Railway Appliance Co.

**Regulators, Oxy-Acetylene.**
Oxweld Railroad Service Co., The.

**Relays.**
General Railway Signal Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

**Removers, Paint & Varnish.**
Oakite Products, Inc.

**Repair Parts, Stoker.**
Standard Stoker Co.
Q & C Company, The.

**Retorts, Creosoting.**
Graver Tank & Mfg. Corp.

**Reverse Gear, Power.**
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

**Rivet Cutters.**
Ingersoll-Rand Co.

**Riveters, Hydraulic.**
Birdsboro Steel Foundry & Machine Co.

**Riveting Machines.**
Ingersoll-Rand Co.

**Rivets.**
Inland Steel Co.
Neely Nut & Bolt Co.
Ryerson & Son, Joseph T.
Pressed Steel Car Co.
Russell, Burdsall & Ward Bolt and Nut Co.

**Rods.**
Neely Nut & Bolt Co.

**Rolled Steel.**
Carnegie Steel Co.

**Roller Bearings—(See Bearings, Roller).**

**Rolls, Bending & Straightening.**
Birdsboro Steel Foundry & Machine Co.

**Roof Slabs, Concrete.**
Federal American Cement Tile Co.

**Roofing, Asbestos.**
Carey & Co., Philip, The.
Johns-Manville Corp.
Lehon Co., The.

**Roofing, Buildings.**
Armco Railroad Sales Co.
Carey Co., Philip, The.
Lehon Co., The.
Johns-Manville Corp.
Superior Sheet Steel Co., The (Division of Continental Steel Corp.).

**Roofing, Car.**
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Carey & Co., Philip, The.
Hutchins Car Rfg. Co.
Johns-Manville Corp.
Lehon Co., The.
Superior Sheet Steel Co., The (Division of Continental Steel Corp.).
Tuco Products Corp.
Union Metal Products Co.

**Roofing, Corrugated.**
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Carey Co., Philip, The.
Johns-Manville Corp.

**Roofing, Tile.**
Federal American Cement Tile Co.

**Roofing, Tile, Cement.**
Federal American Cement Tile Co.

**Roofing, Tin.**
American Sheet & Tin Plate Co.

**Rope, Wire — (See Wire Rope).**

**Rust Preventatives.**
Dearborn Chemical Co.
Oakite Products, Inc.

**Safe Ends.**
National Tube Co.

**Sand Drying Plants.**
Roberts & Schaefer Co.

**Sanitary Products.**
West Disinfecting Co.

**Sash Balances.**
Tuco Products Co.

**Saws, Circular Metal.**
Ryerson & Son, Joseph T.

**Saws, High Speed, Friction.**
Ryerson & Son, Joseph T.

**Saws, Portable Rail.**
Industrial Brownhoist Corp.
Q & C Co., The.

**Scales.**
Fairbanks-Morse & Co.

**Scrapers, Wheeled and Drag.**
Western Wheeled Scraper Co.

**Screens, Passenger Car.**
Tuco Products Corp.

**Seats, Car.**
Brill Co., The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Co.

**Seats, Coach.**
Brill Co., The J. G.

**Shafting.**
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.
Standard Steel Works Co.

**Shapers.**
Ryerson & Son, Joseph T.

**Shapes, Pressed Steel.**
Pressed Steel Car Co.
Sellers & Co., Inc., Wm.

**Shapes, Structural.**
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

**Sheds, Train.**
American Bridge Co.
Inland Steel Co.

**Sheets, Black and Galvanized.**
Allegheny Steel Co.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Inland Steel Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

**Sheets, Blue Annealed.**
Allegheny Steel Co.

**Sheets, Building, Special Car, Corrugated & Plain.**
Armco Railroad Sales Co.

**Sheets, Corrugated.**
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Carey Co., Philip, The.
Carnegie Steel Co.
Johns-Manville Corp.
Ryerson & Son, Joseph T.

**Sheets, Corrugated & Plain.**
Inland Steel Co.
Ryerson & Son, Joseph T.

**Sheets, Electrical.**
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

**Sheets, Iron & Steel.**
Armco Railroad Sales Co.
Bethlehem Steel Co.
Superior Sheet Steel Co., The (Division of Continental Steel Corp.).

**Sheets, Locomotive Jacket.**
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Inland Steel Co.
Ryerson & Son, Inc., Joseph T.

**Sheets, Polished or Planished Iron.**
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.

**Sheets, Steel.**
Armco Railroad Sales Co.
Inland Steel Co.
Ryerson & Son, Joseph T

**Sherardising Plants.**
General Electric Co.

**Shop Calling Systems—(See Systems, Communication).**

**Shops, Railroad—(See Buildings, Iron, Steel and Steel Concrete).**

**Shovels & Draglines.**
Industrial Brownhoist Corp.

**Shovels, Steam, Gasoline & Electric.**
Orton Crane & Shovel Co.

**Siding, Iron & Steel.**
Armco Railroad Sales Co.

**Siding., Bldg., Car, Corrugated & Plain.**
Kinnear Mfg. Co.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Inland Steel Co.
Ryerson & Son, Inc., Joseph T.

**Siding, Corrugated & Plain.**
Carey & Co., Philip, The.
Johns-Manville Corp.

**Signal Accessories.**
Electric Storage Battery Co.
General Electric Co.
General Railway Signal Co.
Graybar Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

**Signals, Automatic Cab.**
General Railway Signal Co.
Union Switch & Signal Co.

**Signal Blades.**
General Railway Signal Co.
Union Switch & Signal Co

**Signals, Crossing.**
Union Switch & Signal Co.

**Signals, Crossing Protection.**
General Railway Signal Co.
Railroad Supply Co.

**Signals, Railway.**
General Electric Co.
Union Switch & Signal Co.

**Sign Posts, Treated.**
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
National Lumber & Creosoting Co.

**Signs, Highway Crossing.**
Railroad Supply Co.

**Silico Manganese.**
Vanadium Corp. of America.

**Slabs, Concrete Floor.**
Federal Cement Tile Co.

**Slag, Blast Furnace.**
Carnegie Steel Co.

**Slotting Machines.**
Sellers & Co., Inc., Wm.

**Slotting Machines, Locomotive Cylinder.**
American Steel & Wire Co.

**Sludge Removers.**
Bird-Archer Co., The.

**Soap, Liquid.**
West Disinfecting Co.

**Solder.**
National Bearing Metals Corp.
Ryerson & Son, Inc., Joseph T.
Westinghouse Elec. & Mfg. Co.

**Spark Arresters.**
Locomotive Firebox Co.

**Speed Indicators & Recorders.**
Valve Pilot Corp.

**Spelter—(See Zinc).**

**Spikes.**
American Steel & Wire Co.
Bethlehem Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

**Splice Bars, Angle.**
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.

**Spring Plates or Seats.**
Allegheny Steel Co.
National Malleable & Steel Castings Co.
Union Spring & Mfg. Co.

**Springs.**
American Steel Foundries Co.
American Steel & Wire Co
Baldwin Locomotive Works The.
Pittsburgh Spring & Steel Co.
Railway Steel Spring Co.
Standard Steel Works Co.
Union Spring & Mfg. Co.
Union Switch & Signal Co.

**Springs, Shop Equipment.**
Ryerson & Son, Joseph T.

**Springs, Vanadium Steel.**
Pittsburgh Spring & Steel Co.
Union Spring & Mfg. Co.

**Stacks, Steel.**
American Bridge Co.
Graver Tank & Mfg. Corp.

**Stands, Switch & Target.**
Q & C Co., The.

**Staybolts.**
American Locomotive Co.
Ewald Iron Co.
Ryerson & Son, Joseph T.

**Staybolts, Hollow.**
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

**Steam Chests.**
Franklin Railway Supply Co., Inc.

**Steam Enclosures, Corrugated Iron.**
Republic Steel Corp.

**Steam Shovels.**
Orton Crane & Shovel Co.

**Steel Alloy.**
Illinois Steel Co.
Ryerson & Son, Joseph T.
Republic Steel Corp.
Standard Steel Works Co.

**Steel, Firebox.**
Carnegie Steel Co.
Illinois Steel Co.

**Steel & Iron, Stainless.**
Allegheny Steel Co.

**Steel, Open Hearth.**
Carnegie Steel Co.
Illinois Steel Co.

**Steel Plate Construction.**
Graver Tank & Mfg. Corp.

**Steel, Pressed Specialties.**
Hale-Kilburn Co.

**Steel, Structural.**
American Bridge Co.
Carnegie Steel Co.
Graver Tank & Mfg. Corp.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

**Steel, Tool.**
Illinois Steel Co.
Midvale Co., The.
Q & C Co., The.
Ryerson & Son, Joseph T.

**Step Joints.**
Q & C Co., The.
Rail Joint Co.

**Steps, Car—(See Car Steps, Safety).**

**Stokers, Locomotive.**
Lower Stoker Co.
Standard Stoker Co.

**Stokers, Mechanical.**
Westinghouse Elec. & Mfg. Co.

**Stoker Repair Parts.**
Lower Stoker Co.
Standard Stoker Co.

**Storm Sewers, Corrugated Iron.**
Republic Steel Corp.

**Strainer, Air.**
Westinghouse Air Brake Co.

**Strainers, Tank Hose.**
Prime Mfg. Co., The.

**Stringers, Bridge, Treated.**
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

**Structural Shapes, Rolled Shapes.**
Carnegie Steel Co.

**Superheaters.**
Superheater Co., The.

**Supports, Bottom Rod Safety.**
Chicago Railway Equipment Co.

**Switch Boards.**
Graybar Electric Co.
Johns-Manville Corp.
Westinghouse Elec. & Mfg. Co.

**Switch Machines.**
General Railway Signal Co.

**Switch Movements.**
Union Switch & Signal Co.

**Switch Ties, Treated.**
American Creosoting Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

**Switches, Electric.**
Electric Service Supplies Co.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

**Switches & Switch Stands.**
Ramapo Ajax Corp.

**Syphons, Corrugated Iron.**
Republic Steel Corp.

**Syphons, Locomotive.**
Locomotive Firebox Co.

**Syphons, Locomotive, Boilers**
Locomotive Firebox Co.

**Tables, Welding.**
Oxweld Railroad Service Co., The.

**Tables, Welding.**
Oxweld Railroad Service Co., The.

**Tamping Machines, Tie.**
Ingersoll-Rand Co.

**Tamping Outfits, Tie.**
Ingersoll-Rand Co.

**Tank Cars.**
General American Tank Car Corp., The.

**Tanks, Acetylene, Gas.**
Oxweld Railroad Service Co., The.

**Tanks, Air, Gas, Oil and Water.**
Baldwin Locomotive Works, The.
Graver Tank & Mfg. Corp.

**Tanks, Water.**
American Bridge Co.
American Locomotive Co.
National Tube Co.
Pressed Steel Car Co.
Westinghouse Air Brake Co.

**Tape, Insulation.**
Johns-Manville Corp.
Westinghouse Elec. & Mfg. Co.

**Taps, Staybolt.**
Ryerson & Son, Joseph T.

**Tele. & Tele. Wire.**
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Supply Corp.

**Terminals, Railroad.**
United Engineers & Constructors, Inc.

**Testers, Boiler.**
Sellers & Co., Inc., Wm.

**Testers, Gage.**
Ashton Valve Co.

**Testers, Rail.**
Sperry Products, Inc.

**Testers, Staybolt.**
Flannery Bolt Co.

**Testing Machines.**
Baldwin-Southwark Corp.

**Thermostats.**
Gold Car Heating & Lighting Co.
Vapor Car Heating Co., Inc.

**Tie Plates.**
Bethlehem Steel Co.
Illinois Steel Co.
Inland Steel Company
Railroad Supply Co.

**Ties, Creosoted.**
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

**Ties, Steel.**
American Bridge Co.
Bethlehem Steel Co.
Carnegie Steel Co.

**Ties, Treated.**
American Creosoting Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

**Tile, Cement, Concrete.**
Federal American Cement Tile Co.

**Timber, Treated.**
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber Co.
Southern Wood Preserving Co.
Wood Conversion Co.

**Tires.**
Firestone Tire & Rubber Co.
General Tire & Rubber Co.
Goodyear Tire & Rubber Co.
Goodrich Rubber Co., B. F.

**Tires, Steel.**
Edgewater Steel Co.
Midvale Co., The.
Railway Steel Spring Co.
Standard Steel Works Co.

**Toilet Papers**
U. S. Envelope Co.

**Tools, High Speed Steel.**
Bethlehem Steel Co.
Bird-Archer Co., The.

**Towers, Floodlight.**
Pyle-National Co.

**Track Skates.**
Q & C Co., The.

**Tractors.**
Caterpillar Tractor Co.
Elwell-Parker Electric Co.
Industrial Lumber Co.
International Creosoting & Construction Co.

**Tractors, Industrial.**
Elwell-Parker Electric Co.
International Harvester Co.

**Tractors, Turntable.**
Nichols & Bro., Geo. P.

**Train Control Systems.**
General Railway Signal Co.
Union Switch & Signal Co.

**Tramways, Wire Rope.**
American Steel & Wire Co.

**Transfer Tables.**
American Bridge Co.
Industrial Brownhoist Corp.
Nichols & Bro., Geo. P.

**Transformers.**
General Electric Supply Corp.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

**Trap Doors.**
Edwards Co., O. M.

**Trap Doors & Fixtures.**
Tuco Products Corp.

**Traps, Steam.**
Johns-Manville Corp.

**Treads, Bridge Floor.**
Carnegie Steel Co.

**Treads, Safety.**
Ryerson & Son, Joseph T.

**Treatment Water—(See Water Softening and Purifying).**

**Truck Frames—(See Frames, Truck).**

**Trucks, Oxy-Acetylene Supply.**
Oxweld Railroad Service Co., The.

**Trucks, Car and Locomotive.**
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works.
Bettendorf Company, The.
Birdsboro Steel Foundry & Machine Co.
Brill Co., The J. G.
Flexible Truck Co.
Franklin Railway Supply Co., Inc.
Gould Coupler Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Standard Car Truck Co.
Symington Co., The.

**Trucks, Cast Steel Tender.**
General Steel Castings Corp.

**Trucks, Cast Steel, Electric Car.**
General Steel Castings Corp.

**Trucks, Cast Steel, Car and Locomotive.**
General Steel Castings Corp.

**Trucks, Electric Storage Battery.**
Elwell-Parker Electric Co.

**Trucks, Industrial.**
Elwell-Parker Electric Co.

**Trucks, Motor.**
Dodge Motor Truck Corp.
General Motors Truck Co.
International Harvester Co.
Reo Motor Car Co.
White Co., The.

**Trucks, Tender.**
Flexible Truck Co.

**Trucks, Trailer.**
Brill Co., The J. G.
Franklin Railway Supply Co., Inc.

**Tubes, Arch.**
National Tube Co.

**Tubes, Boiler.**
Allegheny Steel Co.
Armco Railroad Sales Co.
Bethlehem Steel Co.
Globe Steel Tubes Co.
National Tube Co.
Ryerson & Son, Joseph T.

**Tubes, Boiler, Charcoal Iron.**
Bethlehem Steel Co.
Reading Iron Co.

**Tubes, Staybolt.**
Falls Hollow Staybolt Co.

**Tubes, Tire.**
Firestone Tire & Rubber Co.
Goodyear Tire & Rubber Co.

**Tubing.**
Aluminum Co. of America.

**Tubing, Seamless Steel.**
National Tube Co.

**Tungsten Metal.**
Vanadium Corp. of America.

**Turbo Generators.**
Electric Service Supplies Co.
General Electric Co.
Pyle-National Co.
Sunbeam Electric Mfg. Co.
Westinghouse Elec. & Mfg. Co.

**Turnbuckles.**
American Bridge Co.
American Steel & Wire Co.
Ryerson & Son, Joseph T.

**Turntable Tractors.**
Nichols & Bro., Geo. P.

**Turntables.**
American Bridge Co.
Industrial Brownhoist Corp.
Nichols & Bro., Geo P.

**Typewriter Ribbons.**
Remington-Rand Business Service.

**Typewriters.**
Remington-Rand Business Service.

**Uncoupling Device.**
Hutchins Car Rfg. Co.

**Undercrossings, Corrugated Iron.**
Republic Steel Corp.

**Underfloor Duct.**
General Electric Supply Corp.

**Underfloor Duct, Fibre and Metal.**
Johns-Manville Corp.

**Underframes, Cast Steel, Tender.**
General Steel Castings Corp.

**Underframes, Cast Steel, Freight Car.**
General Steel Castings Corp.

**Underframes, Steel.**
Bettendorf Co., The.
Brill Co., The J. G.
Pressed Steel Car Co.
St. Louis Car Co.

**Underground Conduit.**
General Electric Supply Corp.

**Upholstery, Car.**
Brill Co., The J. G.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

**Valve Caps.**
Schrader's Son, Inc., A.

**Valve Gears, Locomotive.**
Pyle-National Co.

**Valves, Air Brake.**
Westinghouse Air Brake Co.

**Valves, Back Pressure Acetylene.**
Oxweld Railroad Service Co., The.

**Valves, Blow-Off.**
Bird-Archer Co., The.

**Valves, Check & Angle Steam**
Sellers & Co., Inc., Wm.

**Valves, Drifting.**
Ardco Mfg. Co.
Sellers & Co., Inc., Wm.

**Valves, Hydraulic.**
Birdsboro Steel Foundry & Machine Co.

**Valves, Piston.**
Franklin Railway Supply Co., Inc.

**Valves, Pop, Safety & Relief.**
Ashton Valve Co.
Vapor Car Heating Co., Inc.
Westinghouse Air Brake Co.

**Valves, Pressure Regulating.**
Gold Car Heating & Lighting Co.

**Valves, Throttle.**
American Throttle Co., Inc.
Bradford Corporation.

**Valves, Fire.**
Schrader's Son, Inc., A.

**Varnish Powder.**
Aluminum Co. of America.

**Varnishes.**
General Electric Supply Corp.
Lowe Bros. Co., The
Sherwin-Williams Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

**Ventilators, Car.**
Gold Car Heating & Lighting Co.

**Ventilators, Shop & Roundhouse.**
Carey Co., Philip, The.
Johns-Manville Corp.

**Wardrobes, Rolling and Disappearing Front — (See Lockers).**

**Washers.**
National Malleable & Steel Castings Co.
Ryerson & Son, Joseph T.
Wine Railway Appliance Co.

**Washers, Boiler.**
Sellers & Co., Inc., Wm.

**Waterproofing Materials and Compounds.**
Carey Co., Philip, The.
Johns-Manville Corp.
Lehon Co., The.

**Water Purifying Materials & Compounds.**
Bird-Archer Co., The.
Dearborn Chemical Co.

**Water Softening & Purifying.**
Bird-Archer Co., The.
Dearborn Chemical Co.
Graver Tank & Mfg. Corp.
Permutit Co., The.

**Weather Stripping.**
Tuco Products Corp.

**Wedges, Automatic.**
Franklin Railway Supply Co., Inc.

**Wedges, Journal Box.**
American Steel Foundries.
Gould Coupler Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Symington Co., The.

**Weed Killer.**
Q & C Co., The.

**Welding, Electric.**
Electric Railweld Service Corp.

**Welding Machines, Acetylene.**
Oxweld Railroad Service Co., The.
Ryerson & Son, Joseph T.
Westinghouse Elec. & Mfg Co.

**Welding Machines, Electric.**
General Electric Co.
Ryerson & Son, Joseph T.

**Welding Machines, Flue.**
Ryerson & Son, Joseph T.

**Welding Materials.**
Oxweld Railroad Service Co.
Franklin Railway Supply Co., Inc.

**Welding Process.**
Oxweld Railroad Service Co.

**Welding Rods.**
American Steel & Wire Co.
General Electric Supply Corp.
Oxweld Railroad Service Co., The.
Ryerson & Son, Joseph T.

**Welding Supplies.**
General Electric Co.
Oxweld Railroad Service Co., The.

**Welding and Cutting Apparatus—(See Cutting and Welding Apparatus).**

**Well Casings, Corrugated Iron.**
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

**Wheel Centers, Driving.**
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works, The.
Birdsboro Steel Foundry & Machine Co.
Edgewater Steel Co.
Hunt-Spiller Mfg. Corp.
Standard Steel Works Co.
Union Steel Casting Co.

**Wheels, Car and Locomotive.**
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works, The.
Bethlehem Steel Co.
Carnegie Steel Co.
Edgewater Steel Co.
Griffin Wheel Co.
Illinois Steel Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Railway Steel Spring Co.
Standard Steel Works Co.

**Wheels, Cast Iron, Chilled Tread.**
Assn. of Mfrs. of Chilled Car Wheels.
Graybar Electric Co.
Griffin Wheel Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

**Wheels, Mine Car.**
Carnegie Steel Co.
Edgewater Steel Co.
Griffin Wheel Co.
Mt. Vernon Car Mfg. Co.
Standard Steel Works Co.

**Wheels, Passenger Car.**
Carnegie Steel Co.
Illinois Steel Co.
Edgewater Steel Co.
Griffin Wheel Co.
Pullman Car & Mfg. Corp.
Standard Steel Works Co.

**Wheels, Steel and Steel Tired.**
American Locomotive Co.
American Steel Foundries.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
Lima Locomotive Works.
Railway Steel Spring Co.
Standard Steel Works Co.

**Wheels, Wrought Steel.**
Armco Railroad Sales Co.
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Carnegie Steel Co.
Edgewater Steel Co.
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Ashton Valve Co.

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**Window Fixtures.**
Edwards Co., O. M.
Tuco Products Corp.

**Wire.**
American Steel & Wire Co.
Kerite Insulated Wire & Cable Co.

**Wire, Fence.**
American Steel & Wire Co.

**Wire, Insulated.**
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Co.
Graybar Electric Co.
Kerite Insulated Wire & Cable Co.

**Wire, Rail Bond.**
American Steel & Wire Co.
Graybar Electric Co.

**Wire Rope Clips.**
American Steel & Wire Co.

**Wire Rope.**
American Steel & Wire Co.

**Wire, Telephone & Telegraph.**
American Steel & Wire Co.
Anaconda Wire & Cable Co.
Graybar Electric Co.

**Wire, Welding.**
American Steel & Wire Co.
Oxweld Railroad Service Co., The.

**Wiring Appliances.**
Pyle-National Co.

**Wood, Treated.**
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
Curtin-Howe Corp.
National Lumber & Creosoting Co.

**Wood Preservative — (See Preservative, Wood).**

**Wood, Preservative Treatment (Zinc Meter Arsenic).**
Century Wood Preserving Co.
(Division of the Wood Preserving Corp.)
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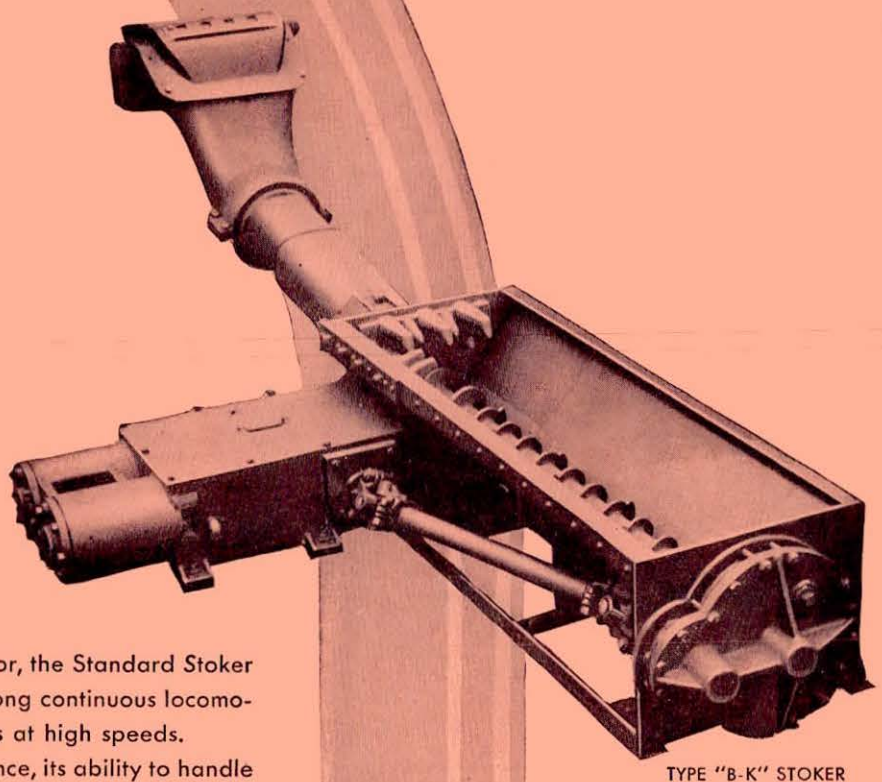

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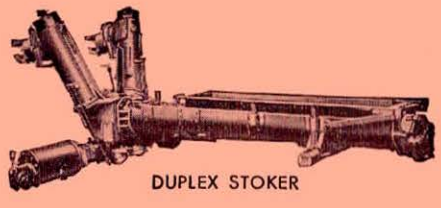

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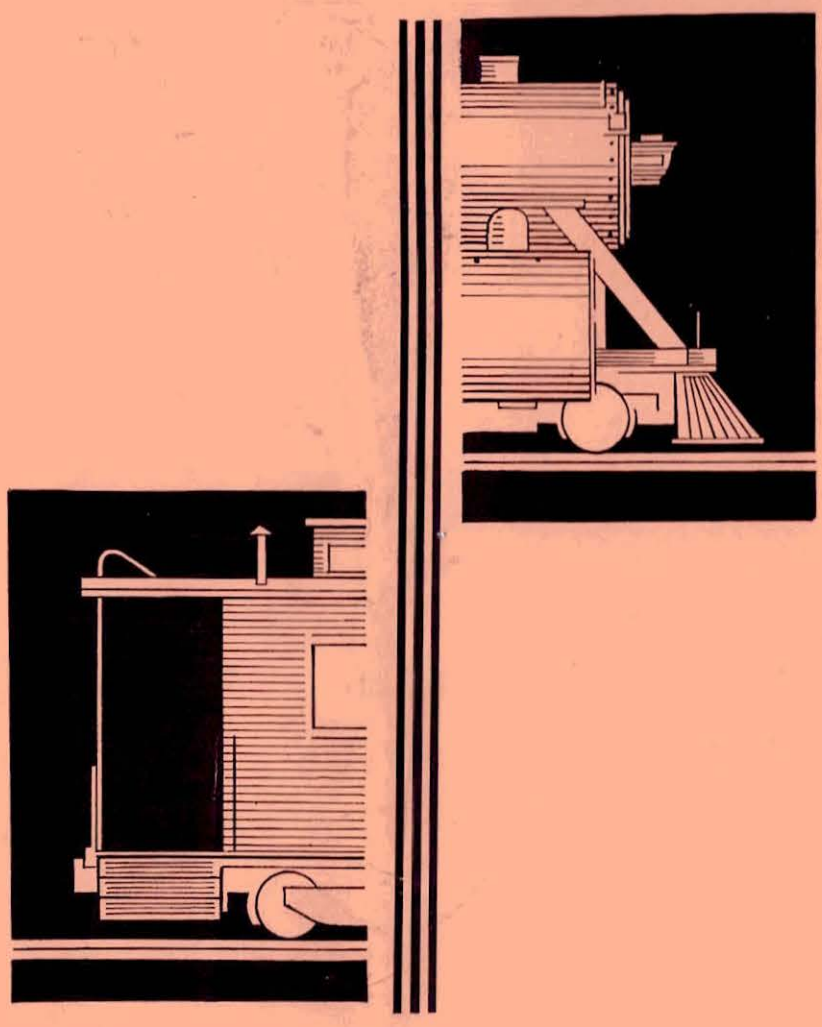

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